SKYWAYS

MILITARY * CIVIL * COMMERCIAL AVIATION

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AVICOM

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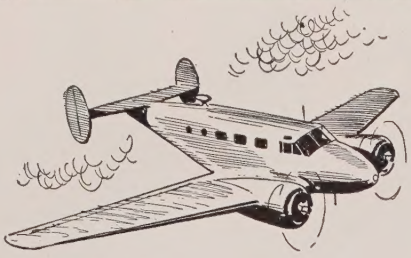
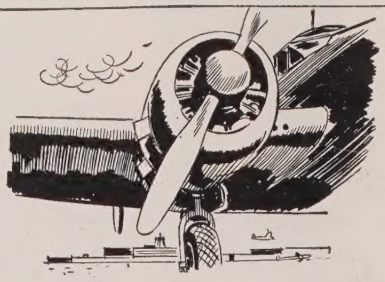
JULY 1950 25¢



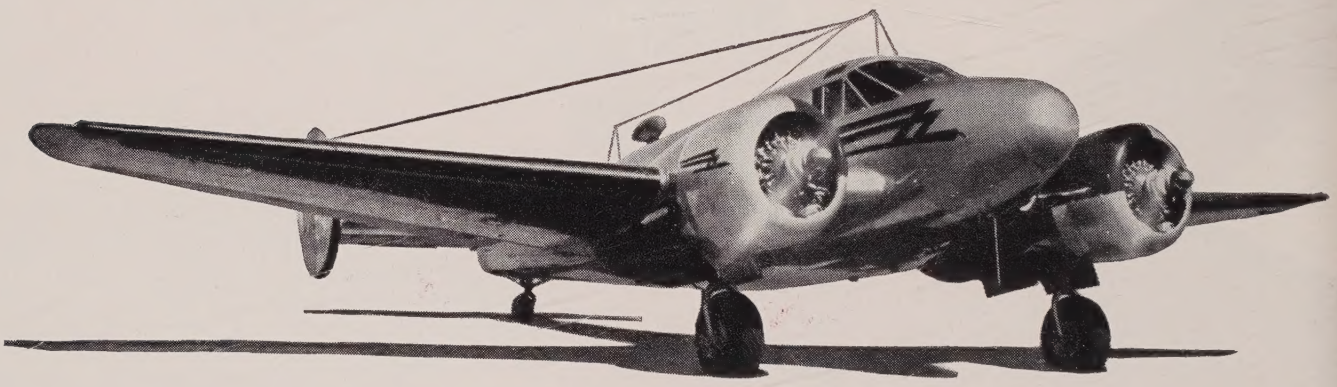
Choose it for speed and performance. With a maximum speed of 230 mph, you're in a class with the Airlines — and you have unsurpassed mobility of action, too.



Choose it for safety. Twin-engine reliability and outstanding single-engine performance provide an assurance of mental ease when flying in less favorable weather conditions.

Choose it because it has proved itself. Wartime versions rolled up hundreds of millions of miles. Today, more than 500 postwar Beech "Twins" are serving leading industries.

For the ultimate in air transportation choose the Beechcraft Executive Transport



Features place the Model D18S in a class by itself

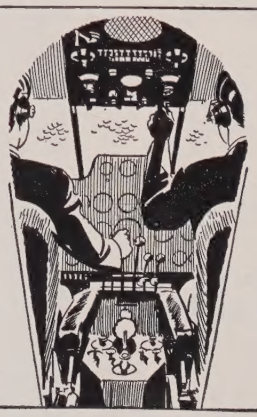
200-mph cruising speed
Rate of climb at sea level, 1,200 feet per minute
Range up to 900 miles
20,500-foot service ceiling
Custom seating arrangement for 7, 8, or 9
Luxurious, temperature-controlled interior
Individual reading lights, ash trays, etc.

● For full information contact your nearest Beechcraft distributor or write on your company letterhead today to Beech Aircraft Corporation, Wichita, Kansas, U.S.A.

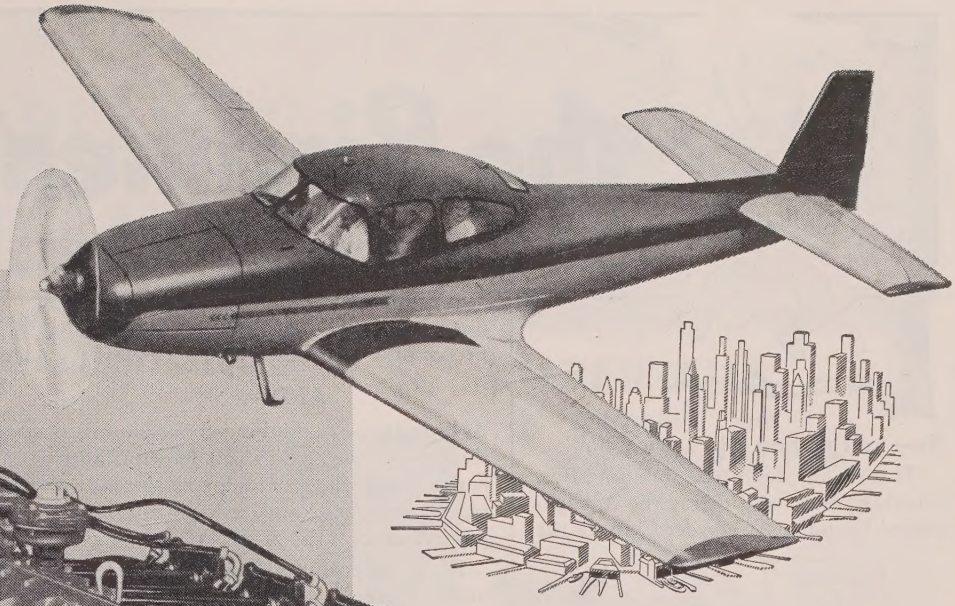
Beechcraft
EXECUTIVE TRANSPORT

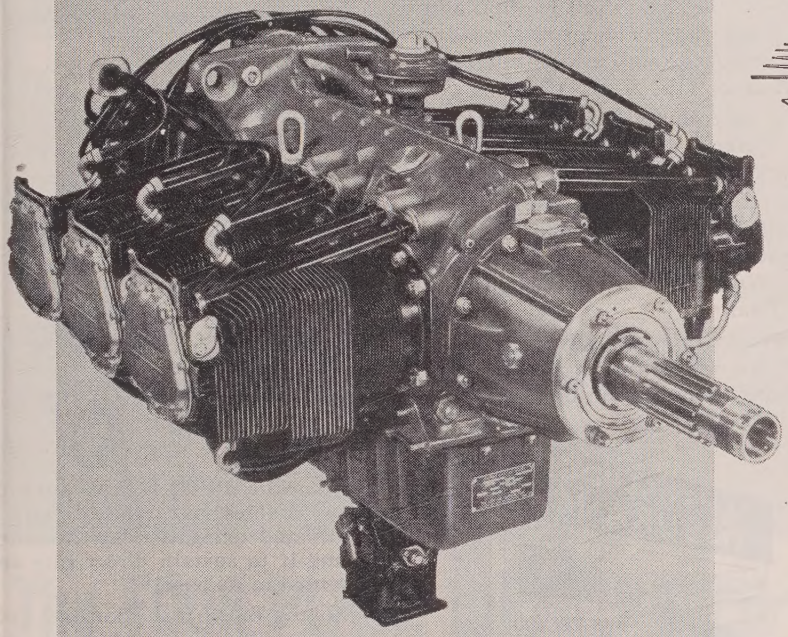
BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

Choose it for luxury. Several custom-interior plans available. Sound-proofed cabin, restful seats, wide windows. You'll feel no travel fatigue here!



And it's the choice of pilots. Extremely efficient instrument and control layout, with major operating units conveniently located on central pedestal.





LYCOMING
GEARED POWER
PUTS THE SUPER IN THE NEW SUPER 260 RYAN NAVION

The new Super 260 Ryan Navion is *powered by Lycoming.* Its dependable Lycoming GO-435 *geared* engine makes possible exceptionally quick take-off, rapid climb, smooth and fast performance with extra safety and comfort.

LYCOMING LEADS THE FIELD with its new GO-435 series engines—with gear reduction of the same type used in big commercial and military planes to gain greater engine and propeller efficiency. Basic design of this outstanding engine has been proven beyond question by thousands of hours of *flight operation.* You can be sure of your plane when it's . . .

POWERED BY

Lycoming

LYCOMING-SPENCER DIVISION

WILLIAMSPORT • PENNSYLVANIA

AVCO MANUFACTURING CORPORATION

AIRCRAFT ENGINES AND RELATED PRODUCTS • AIR-COOLED INDUSTRIAL ENGINES AND RELATED PRODUCTS
PRECISION MACHINE PARTS • RESIDENTIAL AND COMMERCIAL BOILERS • STEEL PLATE FABRICATION • GRAY IRON CASTINGS

The Birdmen's Perch

So—you wanna join a flying club!

That's a fine, high-type ambition! But, whether you're considering the Amalgamated Flying and Chowder Club, or the

Peerless Pilots of Ptomaine Society, check these two points carefully:

(A). Is the club an incorporated club?

(B). Does it carry adequate insurance?

In an *unincorporated* club, should one of the "tried and true" ruin a farmer's barn, *you* could be held personally responsible for damages awarded by a court against the club!

If your club fails to carry adequate insurance, one expensive accident could bankrupt the organization!

For your own protection, check the financial status of any flying outfit before becoming a member of it!

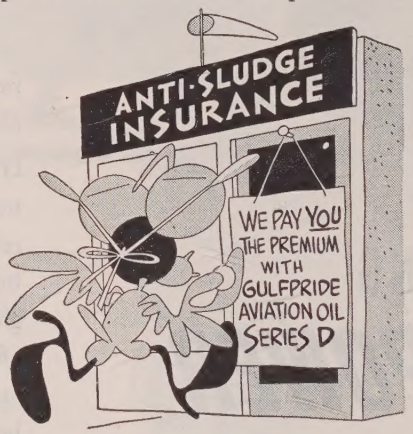
AND—

As long as you're thinking about joining things, join the endless parade of plane-happy pilots who wouldn't consider taking off without a crankcase full of Gulfpride Aviation Oil—Series D!

It's a super-duper lube, the world's finest detergent dispersant oil for horizontally opposed engines!

And, this is important. Gulfpride Aviation Oil—Series D—is the only aviation oil put through Gulf's exclusive Alchlor process to remove those extra carbon and sludge formers.

No wonder rings and valves stay free longer! No wonder pilots increase the periods between overhauls up to 100%!



Call it insurance, if you like—engine insurance that pays *you* a premium in trouble-free flying!

LITTLE KNOWN FACTS DEPT.

How many times have you said to yourself, "Gee, I wisht I was famous!" Well, you can be, Pal, if you'll only read and take heed!

Today we doff our hats to a spectacular citizen of the "Motor City," Mr. William R. Corliss of 20905 West Seven Mile Rd. Detroit!

Bill's L.K.F., with PROOF, earns him the cherished Perch Pilot (br) Commission, wide public acclaim, and possibly a grand increase in salary if he shows this to his boss:

The Lockheed F-90 Fighter not only has two engines, but duplicate sets of controls and navigation instruments, allowing it to sustain direct hits and still return to its base!

Whammy, Bill, that's a good one! Your Commission's on the way. As for the rest of youse chaps . . .

Don't remain unsung forever! Send your Little Known Facts About Well Known Planes—with PROOF—to this address: Gulf Aviation Dept., Gulf Building, Pittsburgh 30, Pa.

Gulf Oil Corporation . . .
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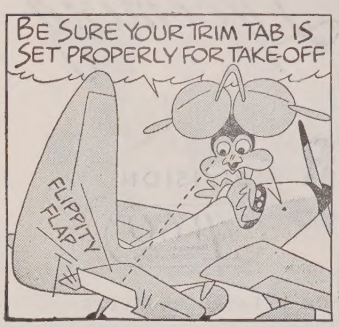
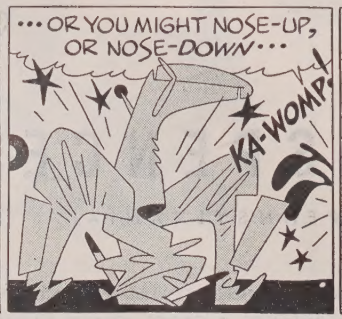
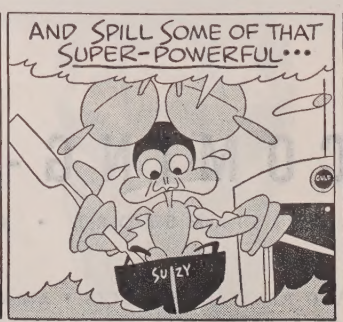
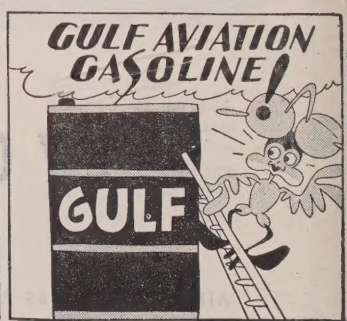
GULF

AVIATION PRODUCTS









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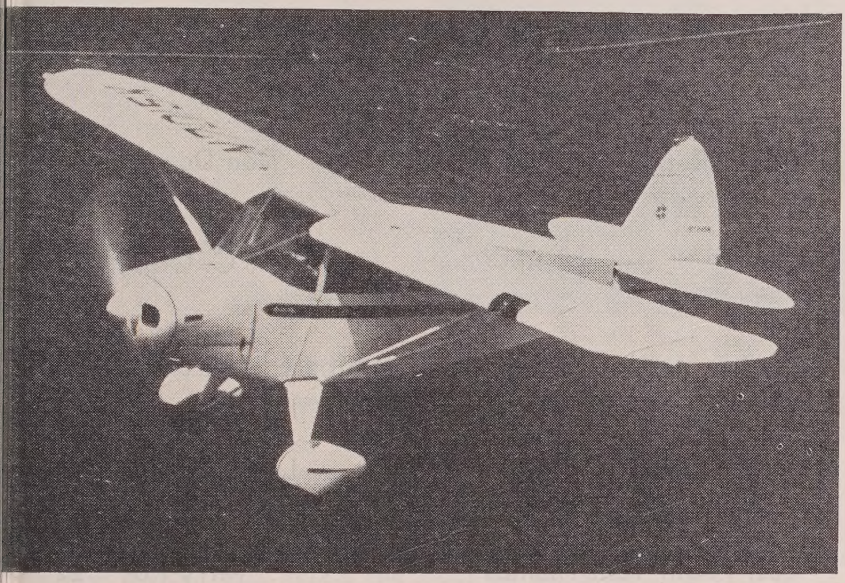
2 PIPER PLANES
Unmatched for Price and Performance



The FOUR-PLACE PIPER PACER

or both price and performance the new 950 Piper Pacer can't be matched. For the same price as most two-place ships, here's a fast, far-ranging four-place plane built by the world's largest manufacturer of personal planes.

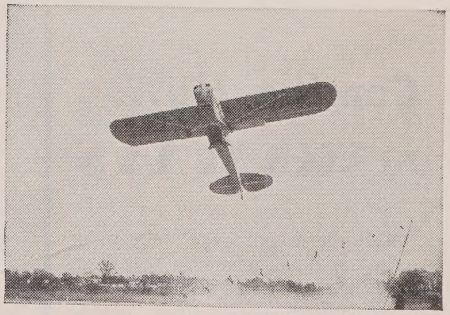
You cruise as fast as 134 mph* in the new Piper Pacer with four people in the comfortable, sound-proofed cabin. Wheel controls, a rear seat readily removable to provide 36 cubic feet of cargo space, front and rear doors and the Piper Hydrasorb landing gear are among the outstanding advantages of this amazing airplane.

Model 135 at 5,000 feet with controllable prop.

These features, all at such a low price, are equalled by the Pacer's flight performance which combines the typical flying ease for which Piper is famous with a solid, big-airplane feel so restful on long flights. The Model 115 with the economical Lycoming 115 hp. engine has many improvements over last year's sensational Piper. The Models 125 and 135 have 125 hp. and flaps for even more nimble performance. Your dollar buys twice as much with the Pacer. Fly it and be convinced yourself. Write for brochure—Dept. SK-7.

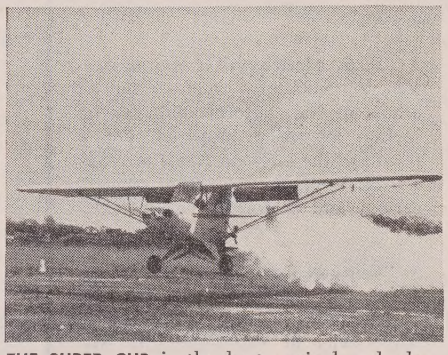
Pacer prices start at **$3,295**

(For Model 115—115 hp.)



SUPER CUB
takes off and lands shorter than any plane available

"BREATH-TAKING" describes the Super Cub's short field performance, unmatched by any plane in production today. With optional tandem-wheel gear it lands safely in very rough fields. Model "95" has 90 hp. Model "105" has 108 hp. and flaps; can fly as slow as 33 mph. Cruises at 105 mph.



THE SUPER CUB is the best agricultural plane ever produced. Rear seat is readily removable to carry bulky farm freight. Factory-equipped with dust or spray equipment if desired, "105" can easily carry its own weight in chemicals. Super Cub prices start at $2795.

YOU CAN'T MATCH THE PACER FOR LOW COST FLYING!

Both direct and indirect operating costs are far lower in the Pacer because it provides better than two-mile-a-minute cruising speed on 125 horsepower and costs several thousand dollars less than other four-place planes of similar performance. This means that four people can travel in the Pacer at less cost than for bus fare, including all expenses. For the charter operator the Pacer can be operated profitably at attractively low rates which guarantee good volume. Yes, the Pacer is the first personal airplane which combines practical performance with real economy.

PIPER
AIRCRAFT CORP.
LOCK HAVEN, PA., U. S. A.

Coming Up... in SKYWAYS

With the August issue, we're right in the middle of a summer season of good flying. Flight instructors are busy with students, airport operators have the welcome hand out for vacationing pilots bound for other parts of the country, and all pilots are getting in many hours of good sky-highing, weekend jaunts on wings to favorite spots. When you stretch out under the wing of your plane for a session in the shadows, have a copy of SKYWAYS with you . . .

- **SKYWAYS' August issue features:**

- **"Pilot's Report—New Ercoupe,"** *by A. H. Hasbrook.* Something new has been added to the Ercoupe . . . and that "something new" is a three-control system. Many a veteran pilot has expressed the desire for an Ercoupe equipped with rudder pedals. At long last such an Ercoupe is available. In this pilot's report, veteran airman A. H. Hasbrook flies both the new two-control Ercoupe and three-control model, and reports in detail the performance and handling qualities of each. For a close-up of these two versions of the Ercoupe, don't miss Hasbrook's pilot report.

- **"U. S. Air Navy,"** *a Special Section.* In answer to requests for an album of Navy aircraft, this special section has been prepared. For a record of the latest in Naval aircraft, see this section . . . photos, specifications and performance figures.

- **"Canyon Caper,"** *by O. A. Kounalis.* Mr. Kounalis is a flight instructor for the Kemp and Delsey Air Service at Salt Lake City Airport #1. On a charter flight, rough air sent Pilot Kounalis looking for refuge in a valley that all too shortly led him into a canyon. When a blasting current of air drove the plane with its pilot and passenger into the depths of the canyon, Kounalis was "up a creek without a paddle." The experience taught Kounalis a lesson. Read about it . . . shudder . . . then promise yourself you'll never do it.

These are just a few of the features of pilot and plane-owner interest in

August Issue

On sale at newsstands July 8

SKYWAYS

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Lockheed Neptune designed to knock out snorkel submarines

Cost of Comfort . . . . . Gerald J. Mills 12
Executive conversions cost plenty but pay off in business promotion

Pilot's Report: Navion "260" . . . . . Don Downie 14
New higher powered Ryan Navion offers better performance

Check . . . and Double-Check . . . Gilbert C. Close 17
Careful pre-flight inspection promotes plane safety, economy

Destroyers Up! . . . . . Albert S. Burchard 18
Easy version of the F-84 adds punch to U.S. forces in Europe

Flight Exam . . . . . L. M. Horton 20
If you have the pre-license shakes, relax . . . and take it

Test Flight Tom Thumbs . . . . . Terry Kay 22
Model planes save test pilots' lives in wringing out new aircraft

Dilbert . . . . . S. H. Warner & Robt. Osborn 26
Dilbert dumps his plane, then takes off again despite the damage

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Fighting planes of our Air Force . . . photos and performance

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ALFRED B. BENNETT . Advertising Manager

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The following publications are combined with SKYWAYS: Air News and Flying Sportsman.

Photos show Mr. Iervolino at his station in a Delta Air Lines DC-6 and enjoying the beach at Miami with a friend.

Spartan files are full of letters from graduates telling of the success they have achieved and how Spartan aided them. One of these letters is from Joe Iervolino, a Brooklyn boy who came to Spartan with the burning desire to become an Airline Pilot. But here's the story in Joe's own words:

"I enrolled at Spartan after the war ended. I had only a private pilot's license and 300 hours, all in Cubs. A Spartan Counsellor outlined an educational plan that would put me in the best qualified position to be considered for a pilot's job. This was quite an order when you consider that I had just completed four years military service as an enlisted man and had never flown military aircraft. I had to compete with many wartime pilots with thousands of hours of accumulated flying time. No one realizes more than I, that without the educational background I received at Spartan, I would never have been able to achieve the position I now hold. Thanks to Spartan and Delta Air Lines. I am now happy on the job for which I had so long wished and worked."

Sincerely yours,

Joe Iervolino

First Officer Delta Air Lines

CAN YOU ACHIEVE SUCCESS?

We'll be perfectly frank. It depends on YOU! If you have the will to study and work, you can achieve success, as did Joe Iervolino. Spartan graduates succeed. They advance faster than those who lack the basic education that can be acquired only through a recognized, well-equipped school. Spartan can supply the training. There is no better! You must supply the ability and determination. But don't wait! Send in the coupon, at once, for complete information, without obligation.

MARK AND MAIL NOW

The New Spartan Multi-Engine Maintenance Mechanic and Flight Engineer Course fills a serious need by supplying men of increased training and knowledge of the operation of large, complex aircraft. Write for Special Folder

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WORLD LEADER IN JETS....
T-33
F-80
F-94
F-90

AIR YOUR VIEWS

The Pay-Off

Gentlemen:

Congratulations on a fine article . . . "Air Photos Pay Off." It was one of the most practical and inspirational articles I have read on the subject, so well detailed and helpful to flyers who, like myself, would like to help defray flying expenses or increase one's means of livelihood through this phase of commercial art. Can't we hear more from Burrows? He must have more up his sleeve on this interesting work.

Keep on giving us good articles like those by the Busy B's . . . Burrows and Balchen.

PAUL WIMMER

Washington 2, D. C.

Thank you, former mail pilot. We looked up Burrows' sleeve and found a Hypo mark, two lens shades, a roll of film and a gas cap from a Cub. Maybe there's an idea up there, too. We'll ask . . . and if there is, we'll get it for you.—ED.

BT Banter

Gentlemen:

Nothing against Sgt. Farmer (*Air Your Views, January*), but I'd like to meet and compare notes with his BT-13-owning friend. I bought a seven-year-old BT-13A in Denver, Colorado, recently on my way from Alaska to West Virginia to enjoy a 47-day furlough. The old ship cruised like a swan at 140.

On take-off I had full throttle, flat pitch, then I pulled the two-position prop into deep pitch after clearing the ground. When I had cleared the obstacle altitude off the end of the runway, I throttled back slightly to 2100 rpm for the climbing circle and forward cruise.

As for oil, I left the east portion of the Denver sectional and cruised through three charts eastward to the west portion of the Huntington, West Virginia chart with a keep-filled average of 3½ gallons of Grade #60 oil. On gasoline it used 18 gallons an hour. I was alone, but I had about 150 pounds of luggage strapped into the rear cockpit, thus making a "crew" capacity of 320 pounds.

L. M. FOX

Fort Warren AFB, Wyoming

Gentlemen:

I believe your Air Force friend had the most accurate info.

Recently I flew a BT-13 which had just been re-licensed, painted, buffed, motor overhauled, etc., and my airpseed was 125 mph. Other BT's I've flown have been even slower . . . 120 mph at 1900 rpm and flaps fully retracted.

J. E. BURNHAM

Tiffin, Ohio

The BT score thus far puts Sgt. Farmer's side ahead . . . with our Air Force pilot friend just a slim margin aft . . . so slim, in fact, he's cancelled his request for duty aboard a space ship. He thinks it's safe for him to stick around despite a siege of the BT's.—ED.

Bellanca Biz

Gentlemen:

Some character who writes stuff for the AOPA Newsletter reported your pilot didn't fly a licensed Bellanca, but instead did a pilot's report from an experimental model that differs a lot from the 1950 production Bellanca. How come?

G. DOLAN

Los Angeles, Calif.

The plane L. M. Horton flew for the Bellanca Pilot's Report was CAA certificated . . . note the license on the ship in the photographs. That pictured-airplane was the one our pilot flew. In fact the only difference between the Bellanca flown for our pilot's report and those Bellancas coming off the line at New Castle, Delaware today are 1) prop is slightly larger and 2) three inches more rudder travel on current Bellancas. Aside from that, the airplanes are identical.—ED.

Hole Prop

Gentlemen:

In reading your article "Two-Holer," that appeared in your April issue *(Air Your Views)*, it brought back memories of Spence Field, Moultrie, Georgia, during 1943-44. We had an AT-6 assigned to our squadron which had suffered a 30-cal. shot in its prop. This, too, was caused by the failure of the gun synchronization during a gunnery run at Eglin Field, Florida.

I'm sure several other fellows can verify this fact as the whine was very audible around 1200 rpm.

G. P. FLOYD

Hicksville, N.Y.

Judging from the quantity of mail received, there are quite a few trainers around with holes in their props. We won't swear to it, however, because all the letters refer to planes flown in Air Force training—and no one knows specifically where those "Holers" are now.—ED.

The Thing

Gentlemen:

In your April issue, which I have just received here in Germany, there is a plane on page 52 called "The Thing." It has a wing span of 12 feet 4 inches, and was built from Standard *Cub* parts.

Could you give me the name and address of the man who built it? Upon my return to the States, I plan to have such a plane for my own personal transportation.

D. BARTLETT

APO, New York

Builder of the Thing is Charles Bailey of Madison, North Carolina.—ED.

Headless

Gentlemen:

In looking over the April issue I came across the picture of the F-80's lined up at Furnstenfeldbruck AFB, Germany. What caught my eye was the crewman standing on the left wing tip . . . said crewman apparently without a head! What happened?

M. J. MARSHALL

Middleboro, Mass.

Dear Eagle-eye: We are pleased to report the Air Force insists it has no headless crewmen. Actually, M.J.M., the crewman in question seems to have chosen the picture-taking moment to look at his shoes. He definitely has a head . . . it's just bowed in the photo.—ED.

Pressure

Gentlemen:

In your April issue, K. A. Stevens said that the wind did not blow parallel to the isobars on a weather map, but at a slight angle to them. This is correct. However, his statement that the wind blows away from a low-pressure area is wrong . . . unless all the meteorology I've learned is wrong.

A. D. SAUTTER

Tulsa, Okla.

Author Stevens is wrong about winds blowing away from a low pressure area. Air moves outward from a High and flows in a clockwise spiral; air moves toward a Low in a counter-clockwise spiral. It was K. A. Stevens who moved counter-clockwise in this instance.—ED.

TULSA AIRMAN Carl Crawford recently set a new loop record of 1,874 loops in *Super Cub*

HANGAR FLYING

New Piper Super Cub

The performance of the new 108-hp *Super Cub* at a demonstration recently startled a lot of people. This new Piper ship, powered by 108-hp Lycoming engine (Model designation—"105") climbed faster than 1,000 fpm and at such a steep angle that it had 1,000 feet of altitude at the end of a 3,000-foot runway! This was with one person aboard. Carrying its maximum CAA-approved gross load of 1,500 pounds, the *Super Cub* gets away in less than 200 yards in still air. In addition to the 108-hp *Super Cub*, a 90-hp is available. Powered by 90-hp Continental, this model is designated the "95." Not equipped with flaps as the "105" is, the *Super Cub* "95" has the same gross weight (1,500 pounds) and carries the same gas load (18 gallons). Here's how performance stacks up:

	"105"	"95"
Cruise	105 mph	100 mph
Ceiling	15,750 ft.	13,500 ft.
Range	270 miles	360 miles
Stall	38 mph (flaps)	44 mph
Rate of Climb	780 fpm	624 fpm
Price	Base price is	$2,795.00

These performance figures are for a *Super Cub* equipped with slowest turning fixed-pitch prop, at gross load and under standard conditions.

License Letter "C"

Word from the CAA grants a reprieve to the letter "C." According to two amendments now being processed by the CAB.

"Aircraft with identification markings on metal-covered surfaces will be required to obliterate the letter "C" on or before December 31, 1950. However, it will not be necessary to relocate the letter "N" so as to close up the spacing."

"Aircraft with identification markings on fabric-covered surfaces will be required to remove the letter "C" and relocate the letter "N" at such time as rejuvenation or replacement of the fabric is necessary, even though such maintenance and modification of markings occurs after December 31, 1950."

Although these two amendments were not "in effect" at time of writing, the CAB has assured us official notice is forthcoming. Watch for that official word!

Dawn Patrol

Pilots and plane owners in the Mid-West are grooming their aerial jalopies for the trek to Muskegon, Michigan in August . . . August 20, to be exact. That's the date for this year's Muskegon Dawn Patrol, a pilot get-together that has them flying in from all parts of the state and as many parts outside the state to compete for a multitude of prizes which include a Continental engine. Sponsored by the Muskegon Junior Chamber of Commerce and backed by Sinny Sinclair, this year's Dawn Patrol promises to be one of the best pilot-picnics ever put together. Last year, over 300 planes flew in to participate in the Muskegon doings; this year the Junior C of C anticipates well over 350 visiting airmen. For details, contact Paul Johnson, the Jaycees' aviation man. Muskegon, by the way, is on the Milwaukee chart.

Plane Owner

While many of us are sitting around trying to figure out how we can manage the purchase of an airplane for our very own, consider the case of Earl D. Osborn who recently took delivery of the eleventh airplane he's owned in the past 27 years. The popular Mr. Osborn, president of the Edo Corporation, now has a four-place Cessna 170 . . . on floats, natch.

An enthusiastic private pilot, Mr. Osborn bought his first plane, an Aeromarine Model "40" flying boat, in 1923. His second was another Aeromarine boat, this one of special sesqui-wing design. Osborn's third was one he built himself and called "Malolo." It was a 110-hp flying boat. Succeeding planes in the Osborn hangar were a Travelair, a Fleet, a Fairchild 24, a Piper *Cub*, a Taylorcraft, then a Piper *Super Cruiser*, an Aeronca *Sedan* and now . . . the new Cessna 170.

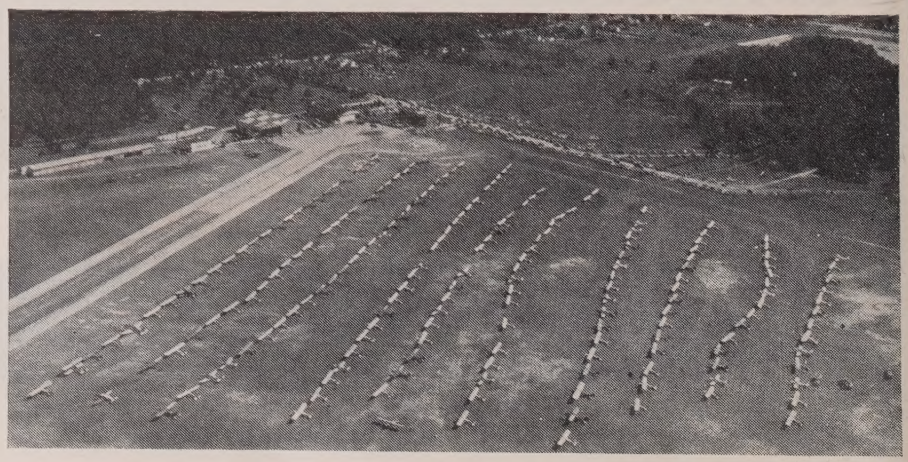
Loop Record

Carl Crawford of Tulsa, Oklahoma, a veteran of 25 years flying, recently set a new loop record of 1,874 loops in a new Piper *Super Cub*. Crawford took off with 48 gallons of fuel at 6.42 A.M. He landed at 11:30 having surpassed the existing record of 1,633 loops set by the late Speed Holman.

News Notes . . .

The Chattanooga Flyers' Club is sponsoring the National Pilots' Air Meet at Chattanooga on July 14, 15 and 16. Midget plane racing is the feature. . . . Merle W. Hemphill has been appointed Deputy Director of the CAA Office of Airports. . . . Minneapolis Aquatennial Association is sponsoring an Air Derby to Grand Rapids, Minnesota, as part of the Minneapolis Aquatennial, July 21 through July 30. Entry fee is $1.00 per plane, and there'll be three sweepstake prizes. . . . CAA has granted its first approval of night flying by civil helicopters under instrument conditions. Recipient of the new approval is Los Angeles Airways, Inc. . . . Bill Key has joined public relations staff of Fairchild. . . . Robert D. Spencer, has been appointed Sales Manager of the Safe Flight Instrument Corp. . . . Gordon Hileman has been named Assistant Sales and Service Manager, Aeronca Aircraft Corp.

DAWN PATROL at Muskegon, Michigan drew 300 planes last year; expect over 350 this year



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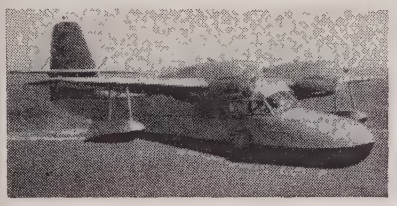


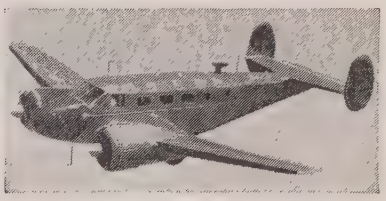
GRUMMAN WIDGEON AMPHIBIANS — 16 FOR SALE—$7300 UP. Late improved model G44A, #89676S, has 250 total hours. Curtiss metal propellers. Equipped with special radio, directional loop, and full gyro instruments. Grumman maintained. Relicensed. New condition. One of the best of the few G44A's available. $16,500. Consult **POWERS & GEORGE.**

BEECH BONANZAS—40 FOR SALE—$5400 UP. November 1948, model A-35, #8741AS, is painted blue and ivory. 345 hours total. Engine 200 hours total. Ship always hangared and never damaged. Beautiful condition inside and out. Reasonably priced at $7875. Offers considered. For further particulars, inspection, and demonstration consult **POWERS & GEORGE.**

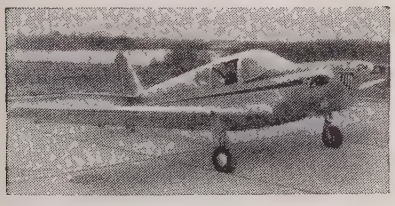
NAVIONS—48 FOR SALE—$4200 UP. 1948 Ryan, #4728KS, has 205 HP engine. Mufflers. Extra tank. Landing lights. Flares. Full blind instruments. 2 radios. Marker beacon receiver. ADF. Southwind heater. Ship painted blue with cream trim. Asking $6500. Exceptional conditions. For complete details, inspection, and demonstration consult **POWERS & GEORGE.**

BEECH STAGGERWINGS—10 FOR SALE—$4000 UP. 1942, D17S, #5740S, has 660 hours total. Engine 48 hours total. Recovered in 1947, fabric is excellent. Yellow. Black trim. Extra tank. 2 radios. ADF. Full blind instruments. Formerly owned by CAA. Top condition. Asking $6000. Offer wanted. For details, price, location and demonstration consult **POWERS & GEORGE.**

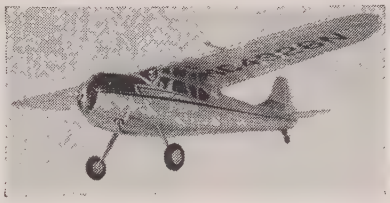
GRUMMAN MALLARD AMPHIBIAN, #43S—FOR SALE—Built for executive transportation, ship carries ten passengers and crew in luxurious comfort. Beautiful interior. Complete airline radio, instruments, and other equipment. Cruises at 180 MPH. Over six hours range. Asking $100,000. Offers considered. For complete details, location and inspection consult **POWERS & GEORGE.**



D18S BEECHCRAFT TWINS—12 FOR SALE. Beautiful corporation-owned executive, #8301?S. New factory-majored engines installed. 2 extra engines with ship. Zero airframe time since 1000 hour check. Nose tank. Airline instruments and radio including VHF. ADF. De-icing piping. Anti-icing. Relicensed February. Exceptional bargain. $25,000. Consult **POWERS & GEORGE.**

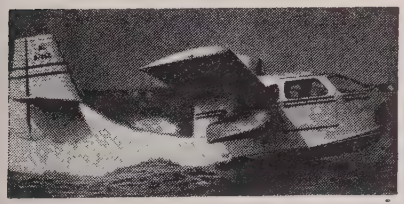


SWIFT 125'S—20 FOR SALE—$1675 UP. December 1947 Temco, #71291S, was purchased new June 1948. 226 hours total. 1948 engine with 141 hours. Aeromatic propeller with new blades. Primary blind instruments. Two-way radio. Special canvas cover. Always hangared. Never damaged. $2350. For details consult **POWERS & GEORGE.**



CESSNA 190, #3769VS—FOR SALE—One of the few 190's available. 304 total hours. 161 hours on new 1949 engine. Mufflers. Wheel pants. Dual wheel controls. Primary blind instruments plus gyro horizon. 2 radios-1 VHF. ADF. Ambulance stretcher installation included. Fine condition. $9525. Make offer. Consult **POWERS & GEORGE.**

GRUMMAN GOOSE AMPHIBIANS—6 FOR SALE—#98497S, now being major overhauled. Will be sold in perfect condition, relicensed, with new outside paint and interior to purchaser's color scheme, and new cables, glass, ADF, etc. Asking $25,750. For details, price and location consult **POWERS & GEORGE.**



REPUBLIC SEABEES—34 FOR SALE—$1900 UP. Late 1947, #6981KS, Serial #971, is one of the last built. All latest modifications. Steerable tailwheel, armor tipped reversible propeller with new blades, stainless cables, dual ignition magneto and distributor. Ship painted silver. All bulletins. October license. Perfect. $2225. For details consult **POWERS & GEORGE.**

STINSON 150'S AND 165'S—FOR SALE—$2000 UP. Large selection. June 1948 Station Wagon 165, #6855MS, has 240 hours. Regio finish. Metal propeller. Mufflers. Primary blind instruments. 2 radios-1 VHF. Marker beacon receiver. Stall warning. Map case. Exceptional condition. Asking $3500. Make offer. For details consult **POWERS & GEORGE.**

BELLANCA CRUISAIRS—23 FOR SALE—$2500 UP. 1947, #77366S, has 325 hours. Mufflers. Aeromatic propeller. Primary blind instruments and gyro. Radio. March license. $3500. Also, 1948, #4155NS, with 200 hours. Aeromatic propeller. Radio. Loop. Landing light. September license. $4000. Both ships excellent. Offers wanted. For details consult **POWERS & GEORGE.**

ALL TYPES OF AIRPLANES AVAILABLE—DETAILS UPON REQUEST—LISTINGS SOLICITED

The Snorkel Sniper

RADOME hung on the belly of the big P2V4 houses a load or radar which enables the *Neptune* to track down subs

By STAN BELTZ

Lockheed Project Test Pilot

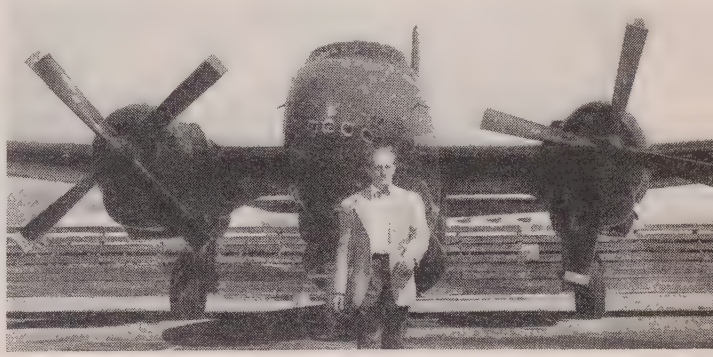
TEST PILOT Stan Beltz, has flown more than 90 per cent of the tests on the long-range P2V series. Engines that power the P2V4 are the new compound Wright R-3350-30W; the propellers are Hamilton Standard hydromatic reversible

SUB-KILLER version of the Lockheed P2V series is the P2V4. Plane's radar can spot the snorkel of a submarine running below the surface. Its armament consists of cannon, rockets, depth charges to blast subs out of seas

THE *Neptune* P2V4 is a submarine bloodhound. If there's a snorkel snooping through the water a thousand miles off shore, the *Neptune* is designed to take care of the situation. She has extreme range, plenty of power and carries a truck load of radar equipment that will spot an oil drum through a thousand feet of fog.

The *Neptune* isn't an airplane to throw a pilot any foul balls. I've flown more than 90 per cent of the tests on the P2V series and the plane has given me a minimum of headaches in spite of some wild and woolly shakedowns.

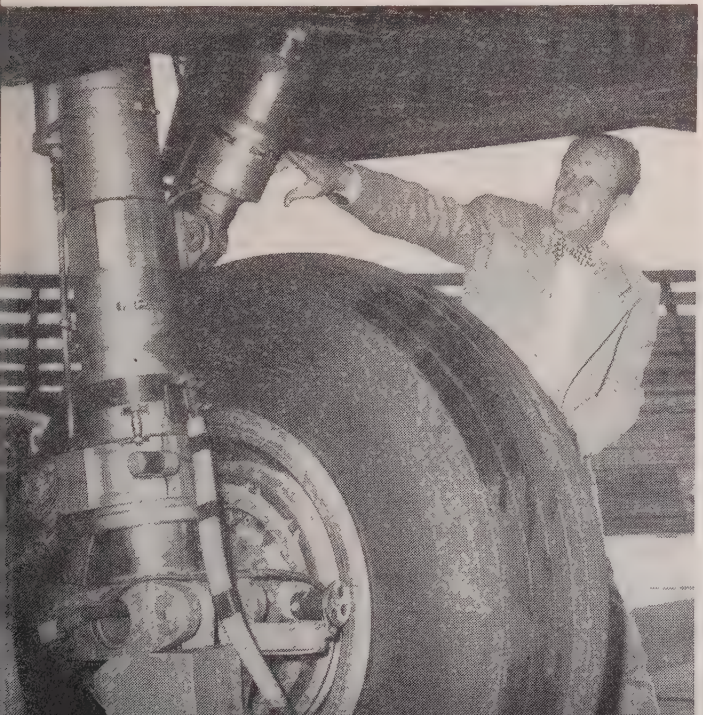
The Navy wanted to know (*Continued on page 36*)



NOSE of the *Neptune* houses six guns. Stan Beltz began his career as a flight-line mechanic at Lockheed

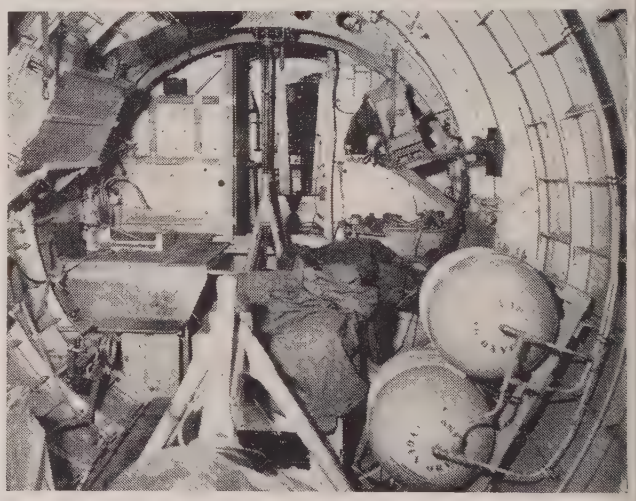
TEST UNIT on *Neptune's* landing gear is pointed out by Pilot Beltz. This unit recorded data from hard-landing tests

VARICAM unit in center of the elevator works like trim tab, and furnishes high-lift tail for tolerance in loading



WAR SURPLUS B-17 was converted by AiResearch Co. for Col. Robert McCormick, publisher of the *Chicago Tribune*

Cost of Comfort



FLYING FORTRESS looked like this *(above)* before its interior was re-built *(left)*. Former bombardier's nose is now the executive ship's "sun deck." In two years the Trib's airplane has been around the world twice on business trips

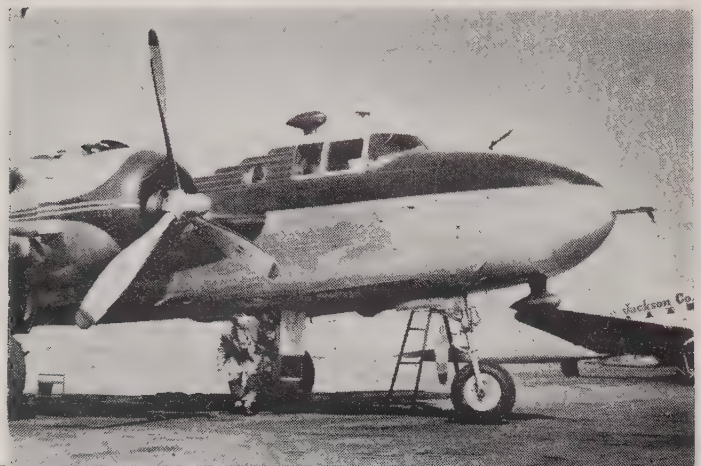
By GERALD J. MILLS

Chief Engineer, AiResearch Aviation Service Co.

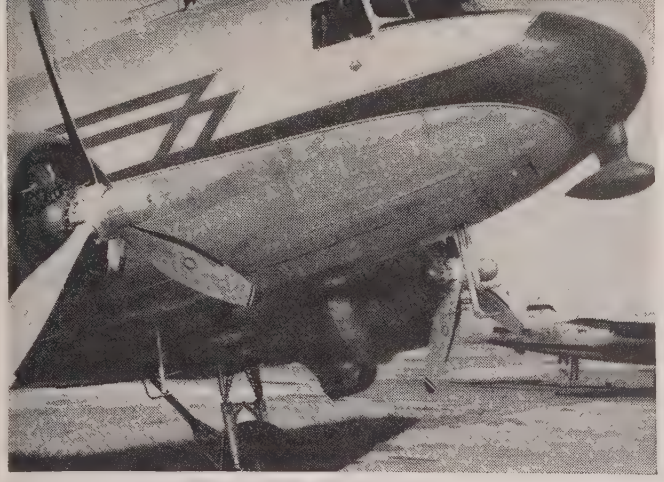
Executive conversions cost plenty but pay off in profit to business

They're all custom-built for comfort. Yet each airplane re-designed for executive use is different. One company may want to transport a six-man board of directors on three-state inspection tours. Another may need to carry 30 men and construction materials to the Alcan Highway. A third may want to deliver "the Boss" and his aids to any

WARTIME B-25, converted for Continental Oil Co., flew from Houston, Texas to New York in 4 hours, 10 minutes



CABIN of the B-25 provides luxury quarters for seven passengers. The engineering on this conversion took 2500 hours



AIRESEARCH DC-3, called "Queenie," has been guinea pig for experimental design for executive conversions

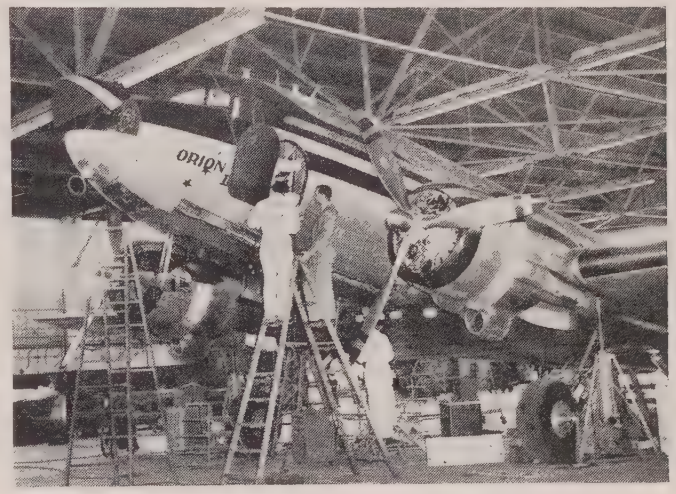
INTERIOR of Signal Oil Company's DC-3 features an air-photo mural between cabin and exec pilot's front office

spot in the world on 20-minutes notice to the crew.

All these executive airplanes, however, have one thing in common. They must be comfortable. The men in the passenger cabin must arrive at their destination rested and ready for a full day's work. Beyond that, each ship is custom designed to fit the particular needs of each specific organization.

It takes a great deal of time and research to make a good executive airplane out of a bare airframe. Throughout the conversion, passenger comfort and utility are the prime considerations. The executive transport is a high-flying office, and the man in the passenger cabin needs to accomplish as much work en route as he would at his desk in the home factory. Full-swivel chairs must be arranged so that a conference may be held without undue effort. There must be a nearby desk for a secretary. Two-way radio telephone with Marine ground stations makes possible communication with any office telephone in the world.

One of our executive conversions owned by Thompson Products, Inc., was having difficulty changing a visual flight plan to an instrument flight plan. The CAA radio channels were jammed and the pilot could not make contact. He went back in the cabin, put through his call and talked to the CAA Airways operator over the telephone when he had been unable to reach him by cockpit radio.



ORION is an executive DC-3 owned by Armstrong Cork Company. The plane here is undergoing its annual inspection

You can't take a surplus military airplane, knock out the bomb bays and gun mounts with a cutting torch and hack saw, and just throw in an office-type interior. Each removal or addition must be carefully engineered and CAA approved. We keep 120 men on our payroll at AiResearch, and 15 per cent of our total conversion expense goes into engineering research. (*Continued on page 44*)

DRAFTING and engineering room at AiResearch Aviation is where the interior designs for executive planes are born

CUSTOM-BUILT furnishings for company planes are made by specialists in the AiResearch Company's furniture shop

Pilot's Report...

Navion "260"

NAVION SUPER "260" is powered by new geared Lycoming engine rated at 260 hp. Plane cruises at an easy 170 mph

New Lycoming-powered* Navion *offers faster take-off, climb, and cruise

By DON DOWNIE

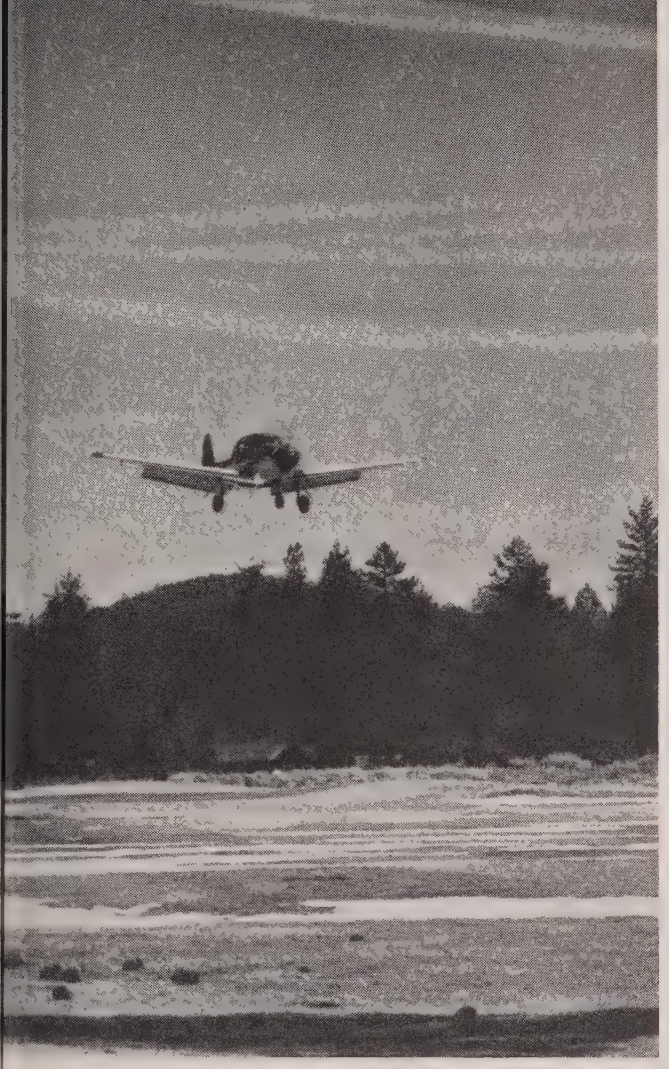
SOMETHING new has been added to the nose of the *Navion.*

The new "260" is by far the best *Navion* ever built. It takes off fast, climbs upstairs in a hurry and naturally cruises better than the lower-powered models.

The top-flight characteristics of the earlier *Navion* —plush comfort and ease of control—remain virtually unchanged. You can even make a fairly accurate GCA let-down on needle-and-ball in this super-stable airplane.

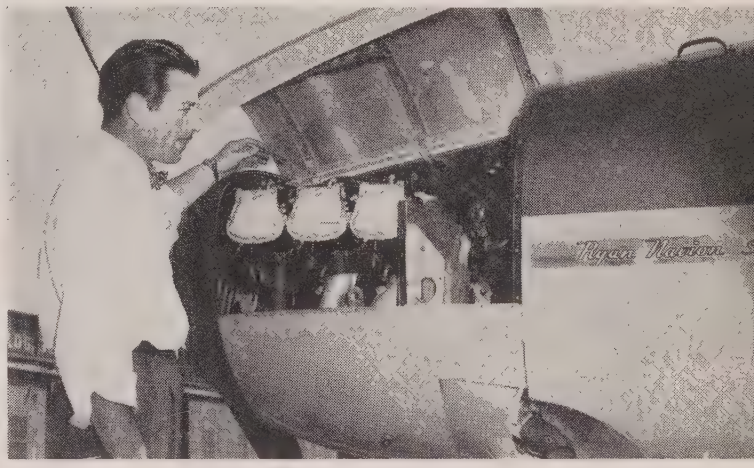
This SKYWAYS "pilot report" was the first to be

FEATURE of 1950 *Navion* is small ventilation scoop aft of rear seat. It improves cabin air circulation 50 per cent



PILOT SLOAN brought the plane into Big Bear on a straight-in approach. With full flaps, he landed at 55 mph

INSTRUMENT readings at cruise were Altimeter—9600 feet; RPM—2800; Manifold Pressure—20 inches; IAS—140 mph



LYCOMING engine, six-cylinder, 260 hp, is geared so that prop turns 1925 rpm while crankshaft turns at 3,000 rpm

flown in the new production "260" by any publication.

"The ship came off the assembly line at 7:30 this morning," said dapper Doc Sloan, Ryan sales pilot. "I'm not sure that there isn't an inspector still in the tail of the airplane! The flight up from San Diego to Burbank took me 48 minutes. That's eight minutes less than it usually takes me in the '205' model."

The recording tachometer read only 4.3 hours when we climbed into the new *Navion*, N5130K, at Paul Mantz' hangar on the (*Continued on next page*)

BIG BEAR AIRPORT was mixture of snow and mud which dragged on the gear as the *Navion* taxied to its take-off position

PHOTO of the new "260" landing at Big Bear points up the *Navion's* flap area and wide landing gear *(above)*. Pilot-Author Downie at controls of the plane made a GCA "landing" at Long Beach NAS. Note improvised hood

Lockheed Air Terminal at Burbank, California.

Almost all the changes in the 1950 "Super 260" have been made forward of the firewall. There's a completely new six-cylinder Lycoming engine in the nose. This powerplant is new to the *Navion*, but not new to aviation. The same basic engine powered over 3,000 military L-5 Stinsons as 190-hp unit. The new version has been geared—77 to 120—so that the propeller turns 1925 rpm while the crankshaft turns 3,000. Nearly all the engines on transport-type aircraft are geared in a similar manner to increase the power output.

To fit the requirements of the new *Navion*, Lycoming has built new cylinder heads, a new crankshaft and gear reduction box, and an accessory case complete with heavy duty Eclipse starter and 12-volt generator. Well over a year of flight testing and engineering has gone into this new installation.

The complete engine installation and propeller weighs an even 100 pounds more than the earlier model, but the added horsepower has upped the allowable gross weight by a hundred pounds, so there is no loss in payload.

For a real shake-down flight in this new model, we suggested a trip to the Big Bear Airport, 6,850-feet above sea level. Our third passenger was Rudy Libra, ex-Berlin Airlifter, and our gross weight on take-off was approaching a full load. At these high altitudes, the added power of the new "260" would be most noticeable. At the time, we didn't know that the field was spotted with patches of snow and in just about the worst possible condition.

"Let me demonstrate the first take-off," said Sloan as we taxied out. Visibility on the ground is just about perfect and the "260" naturally carries all the plush features that made the older model so popular. There is plenty of leg room both front and back, a comfortable headrest in the back seat and ample soundproofing.

During the engine run-up at the end of the field, we checked over some of the new features of the "260." All equipment on N5130K was standard, even to the cylinder-head temperature gage, cowl flaps and the 20-gallon auxiliary tank.

There is a definite feeling of more power under the cowling when the Lycoming (*Continued on page 38*)

BIG BEAR AIRPORT looked like this from plane on final approach. Field elevation is 6,850 feet above sea level

Check...and double-check

PRE-FLIGHT check is Grade A in importance. Before you take off, double-check your plane. With switch off, turn prop through several revolutions and listen for strange or unusual noises; also check prop tip for looseness

By GILBERT C. CLOSE

THE technique employed by many a pilot during pre-flight inspection of the lightplane might be compared to the technique used by a small boy in washing his face . . . once over lightly may be salve to the conscience, but it doesn't result in a thorough job. And careless inspection will result in trouble eventually just as surely as when Mom finds dirt behind Tommy's ears!

Very few accidents are caused by faults that are obviously noticeable. Any pilot, regardless of his carelessness, will notice a bent landing gear strut, a buckled wing rib or a prop blade twisted out of track. The perception of those, we don't worry about. It is the obscure fault that packs the dangerous dynamite—the fault that escapes the pilot's casual visual examination. (*Continued on page 47*)

Destroyers Up!

THUNDERJETS of 31st Fighter Group are shown here on patrol during war games. F-84E's *(above)* replaced the F-47's in Europe

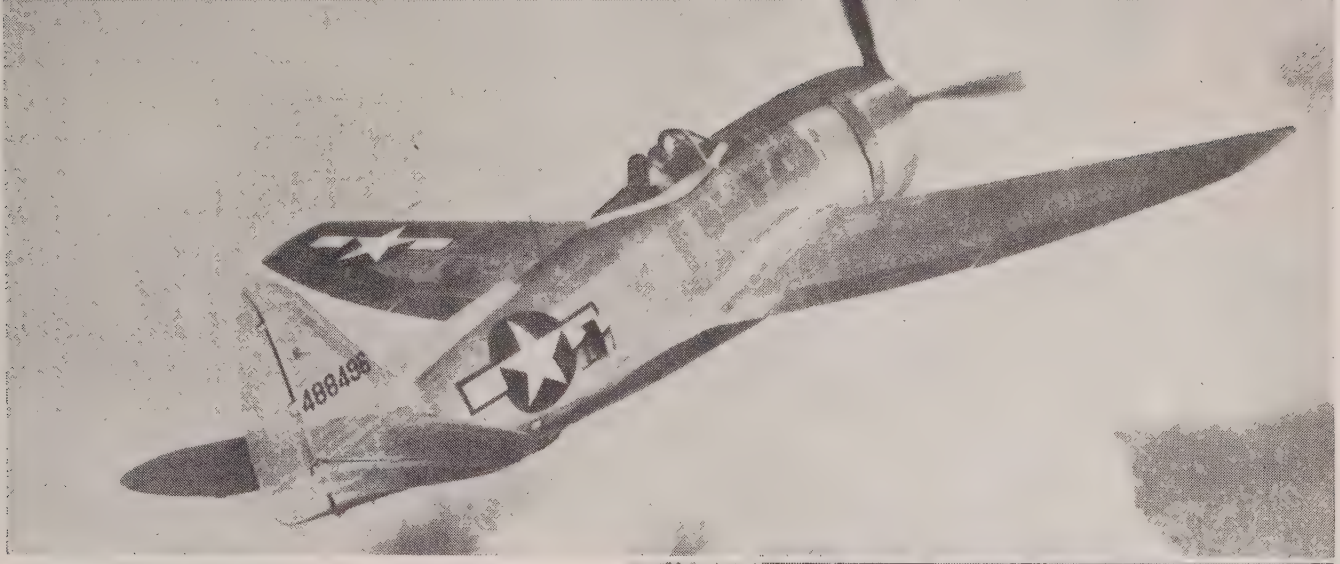
EASY version of F-84 is able to whip into combat maneuvers equipped with wing-tip tanks

By ALBERT S. BURCHARD

Imagine 180 United States destroyers, tearing at 600 mph or more down the picket lines of the westernmost Russian outpost. Imagine these dreadnaughts hammering again and again at the terror of Europe, the mighty Soviet army, flashing to the battle line to loose a broadside and then zoom away into invulnerability, only to return again to smash anew at an army descending upon Europe.

That is the specter facing the masterminds of the Kremlin as they plot world conquest. That is the ace the U.S. Air Force has up its European sleeve.

For the Republic F-84E *Thunderjet* is



AIR FORCE F-47 *Thunderbolts* were flown by the 86th Fighter-Bomber Wing until spring when they and the F-80's were replaced by F-84E's. Production-line maintenance is easier on the Easy version of F-84 *Thunderjet*

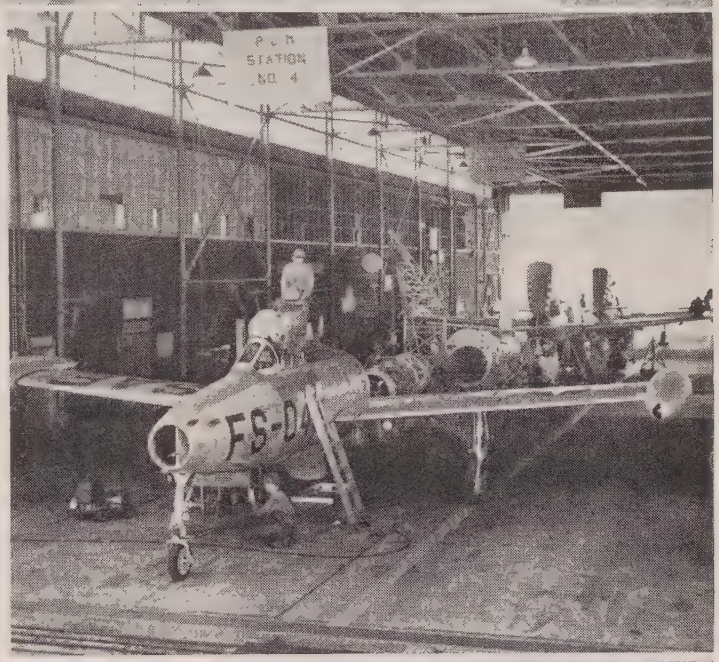
perched on our cold war front line, and the F-84E packs the firepower of a U.S. destroyer—at 600-mph, plus.

Based deep in the American Zone of Germany at fields the once-mighty *Luftwaffe* used, the Air Force 2nd Air Division, under Brig. Gen. Thomas C. Darcy, keeps its wings well polished and its rockets dry.

Darcy, who came up fast through the ranks from first lieutenant to brigadier general in nine years, learned his fighter tactics the hard way in the North African campaign, where modern Yankee tactics were worked out. He is regarded by his boss, Lt. Gen. John K. Cannon, Commanding General, U.S. Air Forces in Europe (USAFE), as one of the world's oustanding authorities on tactical aircraft. And Cannon, who commanded the Mediterranean Allied Tactical Air Force—every fighter aircraft in the theater—during the war, should know.

Under Darcy's 2nd Air Div. are the 86th Fighter-Bomber Wing, commanded by Col. John S. Chennault—an airman supreme by family tradition, and the 36th, under Col. Richard A. Legg.

Until late this spring, the 86th flew conventional F-47 *Thunderbolts* off its field at Neubiberg, Bavaria, while the 36th, at Furstenfeldbruck, Bavaria, had jet F-80's. But Gen. Hoyt S. Vandenberg, Air Force Chief of Staff, (*Continued on page 51*)



TEAMMATES over Bavarian mountains were F-80's and F-47's, until both types were replaced by the fast '84's

Flight Exam

FLIGHT test calls for carefully made pre-flight check. Student works his way 'round the plane while CAA Examiner "grades" the job done. Here *(left)* student checks prop for nicks, cracks or looseness. Pilots, don't rush this pre-flight check

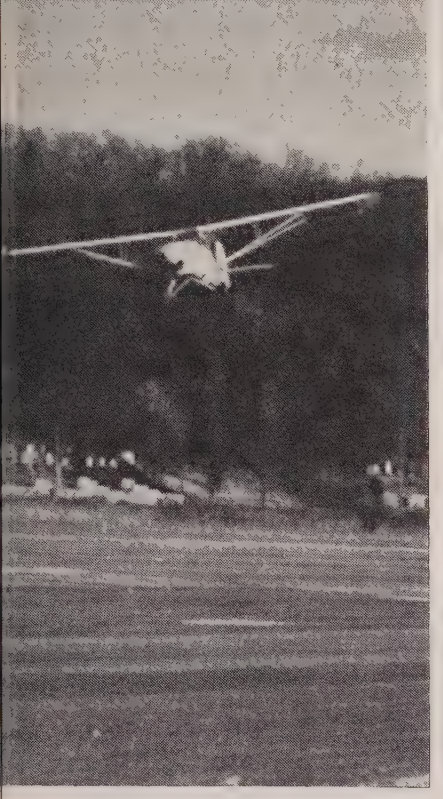
STUDENT must not leave anything to the airport's line-boy. Always check plane's gas and oil yourself. Only then is the pilot-to-be certain of his equipment. Don't rely on plane's gas gage. Best idea is to visually check the tank to be certain

COWL that is secure is an essential item. After the student pilot has checked oil, etc., it's up to him to be sure the cowling is fastened tight so it won't rattle, pop open during flight test. Any coin will tighten cameloc fasteners Be sure gas cap is tight

ATTACHMENTS and all external bracings should be very carefully checked for security. Rudder action and proper tab setting should be noted. During all this, the Examiner will be mentally grading your care, actions in important pre-flight

CAA EXAMINER expects the student to check his parachute's cables, current certificate, etc

TAIL WHEEL must be checked. Rough fields could cause damage or shake a spring loose. Cockpit check calls for a radio "test" if you plan to use it. Check tower communications



FLIGHT test Examiner will expect the student to make side-slip landing

LANDING test won't be hard. Examiner will ask student to make series of three landings, power off, with 180° approach from field-pattern altitude. Don't worry

By L. M. HORTON

ARE you all set up for that private license? Are you beating your chest in joyful anticipation of that test ride your local CAA Examiner is scheduled to give you? Or . . . . . are you scared stiff?

For the third time in your flight career you've heard your instructor say, "You're ready!" The first time was for that important solo; the second time was for your first solo cross-country; and now, the third time, for that elusive private pilot's ticket. This third "You're ready," is what you've been waiting for and working for, but now that it's come you'll only be acting in the normal student-pilot manner if you suddenly feel as though you'd like to forget the whole matter.

Take it from this flight instructor, if you have the shakes, it's strictly SOP. The author had them when he faced his first flight test . . . . and so did that CAA Inspector (who's now referred to as "Aviation Safety Agent") when he went up for his test some time ago.

As an instructor with an understanding soul, I've seen capable students cower, shrivel, grow green, and manifest other outward signs of extreme psychological discomfort at the mere mention of an Examiner or Aviation Safety Agent. Familiar with the emotions of the prospective private pilot, we thought a look at the attitude of the CAA men on flight tests might be enlightening. Perhaps some tips gleaned from their years of experience interviewing and riding students could be passed on to the candidate whose hour is at hand. It might even help eliminate those shakes.

Understand first that every Examiner adheres to the principles of promoting aviation education and safety. If he didn't, he wouldn't be an Examiner. And every Examiner was probably an instructor first, so he has a full understanding of students' problems.

His attitude toward the candidate throughout the whole test, on the ground and in the air, is neutral and objective. Though not a mind-reader or a character analyst, the Examiner does try to determine the temperament of the student pilot and to govern his actions accordingly. After years of practice, it doesn't take a Flight Inspector long to know whether you're flighty or methodical, cocky or scared, eager or timid. He also can tell quickly whether or not you know your airplane, understand the maneuvers, and have a clear picture of the "whys" involved. So don't try to fool him with a false front.

After interviews with Dick Freeland, Deputy-Chief of the Airmen Branch, Region 1, now at Idlewild Airport; Ed Huestis, Aviation Safety Agent at Teterboro Air Terminal; and Stan Konecko, Examiner at Danbury Airport, Connecticut, we came up with a general breakdown of what the average Flight Examiner expects and likes to find in checking the average private- (*Continued on page 52*)

Test Flight Tom Thumbs

By TERRY KAY

Remote-controlled model planes save pilots' lives

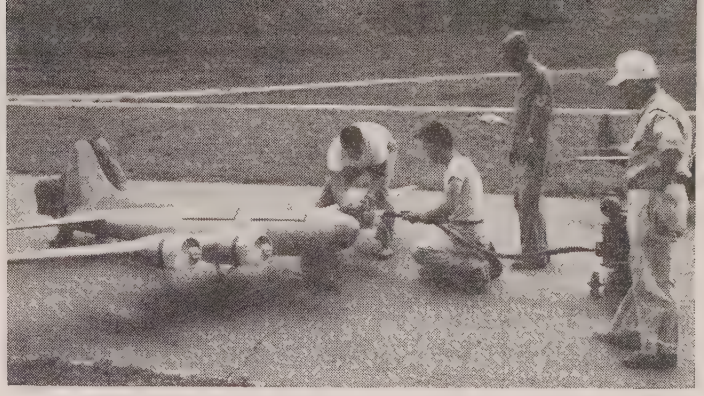
CONTROL LINE is thin but strong wire connects the model to the pylon

PARACHUTE safety landing device on radio-controlled model of the XFG-1 glider gets a check by Stolzenberger *(below left)* and Supervisor Harris

JET EXHAUST whips up cloud of dust as compressor is used to start engine. Fire extinguisher is handy just in case

CONTACT . . . and the unit technician spins the propeller on a remote-controlled model to start its tiny engine

JET MODEL, called all-purpose ship, is powered by units similar to those in V-1 bombs; has top speed of 200 mph



BABY B-17 gets her miniature engines started as technicians prepare for test to augment wind-tunnel tests

THE Air Force pilot-engineer shook his bowed head sadly. Months of wind-tunnel tests stamped the radical XFG-1 glider as a clean design. According to all engineering calculations the swept-forward wing glider would come out of a spin. Yesterday, on its first test flight, the glider spun its pilot to his death.

The engineer's clenched fist banged the table.

"We'll build a small free-flight prototype of the XFG-1," he said, "then we'll test it under actual flight conditions. No more test pilots' lives will be needlessly lost."

Several months later over Lakehurst, New Jersey a tiny replica, complete to the last detail, of the XFG-1 was launched from a Navy blimp. This prototype's test flight together with later full-scale XFG-1 flights, showed up inherent bad spinner flaws in the glider. The design was abandoned. Remote-controlled free-flight model planes, born of the fatal glider crash, had proved their worth.

For the Air Force this successful experiment opened a new vista in tests of radical plane types—that of thoroughly flight testing new plane designs before a full-scale ship is constructed.

Air Materiel Command's Dynamic Model Unit, a division of the Aircraft Laboratory, designs, fabricates, and tests tiny power-driven copies of the USAF's huge air fleet. These Tom Thumb models are not toys, they are highly-precisioned miniature airplanes that in many cases cost as much as $25,000.00 apiece.

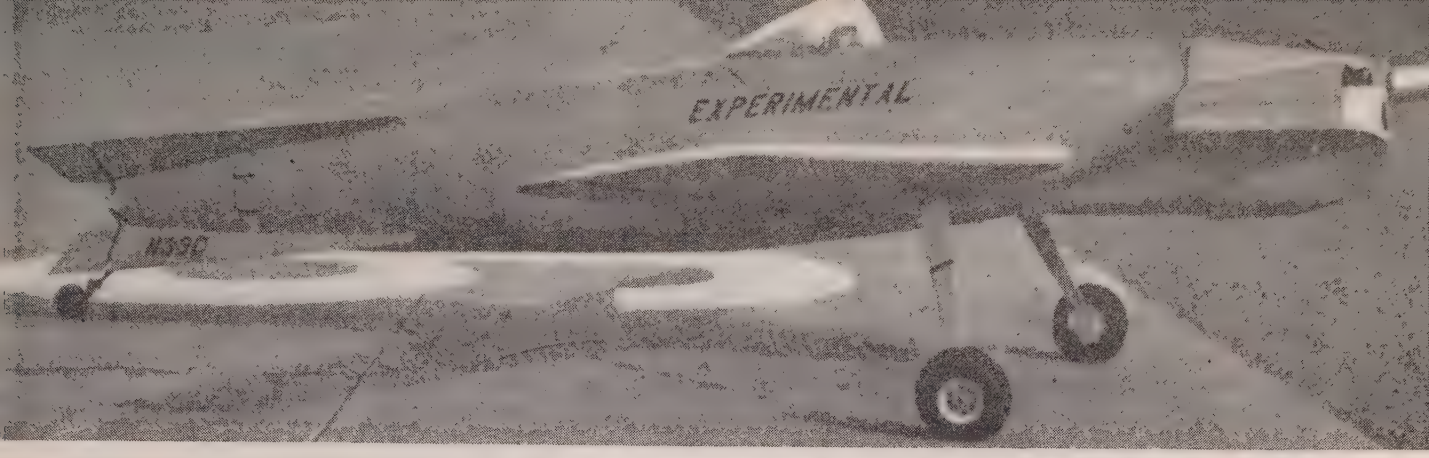
The dinky prototypes vary in size from a four-foot wing spread up to a 20-foot wing spread on a big bomber replica. It (*Continued on page 49*)

PILOT of remote-controlled models sits just outside test area; manipulates controls as he would in real plane

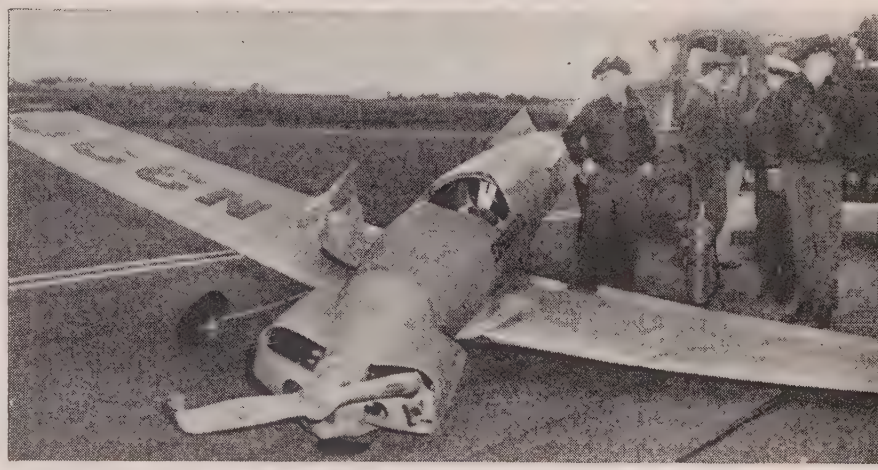
FLIGHT LINE, miniature that is, presents an array of model aircraft of all types: glider, helicopter, four-engine bomber, jets, etc. Air Materiel Command's Dynamic Model Unit is located at Wright Patterson AFB, Ohio

PIPER SUPER CUB, powered by 108-hp Lycoming engine, proves its ability to take-off within a distance of five lengths of its own fuselage. With one person aboard, the *Super Cub* climbs more than 1,000 fpm and at the steep angle shown here. With maximum CAA-approved gross load of 1,500 pounds, *Super Cub* leaves ground in less than 200 yards. It can be used for crop dusting, training; is available with Tandem gear.

DAWN PATROL gathering at Muskegon, Michigan, was good place for Oakley D. Lutes of Jackson, Michigan, to try out his tiny scooter. This scooter folds up and can be carried in baggage compartment . . . with plenty room to spare.



KYSOR 1, an experimental single-seater with a new tail design, was brought out of the hangar for its first test hop recently at the Oakland Airport, California. Pilot-Designer Clifford P. Kysor was at the controls of the new plane. The Kysor 1 reached an altitude of 150 feet, then gave up the idea of flight. Mr. Kysor was uninjured, but his 85-hp plane (*right*) suffered considerable damage to its wings, nose and gear.



ITALIAN HELICOPTER, the first to be made in Italy since the war, was introduced recently to the public. This tear-drop shaped helicopter is powered by an 80-hp engine. According to claims, this engine gives the helicopter a forward speed of 120 mph. It has a ceiling of 11,000 feet. Total weight of aircraft is reported to be half a ton.

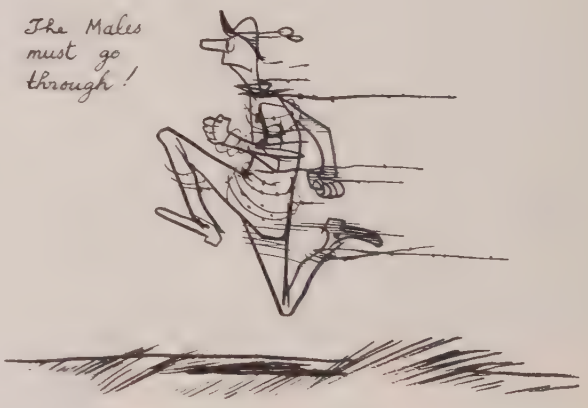
RANGE of the Republic F-84E *Thunderjet* has been increased by the addition of two 230-gallon-plus fuel tanks mounted on bomb shackles under the 84's wing. These tanks, added to the two 230-gallon wing-tip tanks, extend the combat radius of the F-84E from 850 miles to more than 1,000 miles. The swept-wing version of F-84 is YF-96A.

DILBERT

By S. H. Warner and R. Osborn

Pass the Bailing Wire—No one is absolutely worthless; not even Dilbert. A *horrible example* may not be much to brag about, but if it weren't for nitwits like him the rest of us might pull some of the same boners they do. Here's his latest.

He drifted way off course during a X-C, and was forced to stop for gas at an emergency field some 60 miles short of home. The combination of small field and light load evidently was too much of a handicap for Dilbert; he floated past midfield before contact and took down a fence on his run-out.

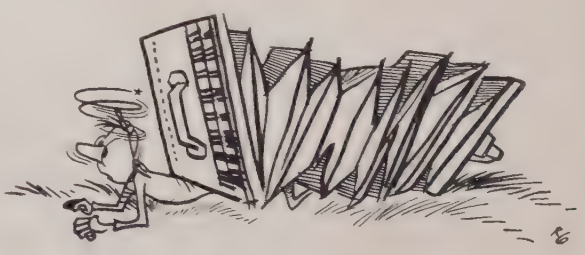


Everything might still have been all right, but Dilbert had a date that night and was anxious to get home—too anxious to use good judgment. He arranged to pay for repairs to the fence and, while the plane was being gassed, he slapped a patch on the port stabilizer. When the attendant pointed to several other holes and the battered leading edges of both wings, Dilbert airily brushed aside his warning.

"The prop wasn't touched, and I've got lots of extra power. I'll make it."

Dilbert had a girl back in Podunk.

He did get in the air (*Continued on page 40*)



1. If, while taxiing, you receive a series of red flashes from a directed traffic-control light, what should you do?

2. Is it correct to depend solely on the gyro horizon when flying on instruments?

3. When is the application of brake of greatest value in preventing a groundloop or swerve?

(Answers on page 40)

"Half a Dilbert brews as much trouble as a whole"

CAOA REPORT . .

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the member firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. The CAOA headquarters are located at 444 Madison Avenue, New York 22, N. Y.

New CAOA Members

Once again seven is the magic number for new members in one month. Here they are:

The M. A. Hanna Company. Dealers in coal and iron ore, this is the latest addition to our growing Cleveland group. The company operates a Lockheed PV-1 *Ventura.* T. F. Richardson is Assistant Treasurer, and James Gott is Chief Pilot.

Wings, Inc. This well-known Beechcraft distributor and fixed-base operator at Wings Field, Ambler and Philadelphia International Airport has been accepted as an Associate Member. The company operates a Beechcraft *Bonanza.* Veteran pilot T. Guy Miller is the company president and pilot. By mid-summer new facilities for executive aircraft and their pilots will be in operation at Philadelphia.

Hercules Powder Company. Hercules, located at Wilmington, Dela., has an excellent utilization record on its Douglas DC-3 and Lockheed *Lodestar,* with better than 700 hours per year on each. M. W. Sheppard is Director of Traffic and Victor E. Edwards is Chief Pilot.

The Whitney Chain Company of Hartford. A division of Whitney-Hanson Industries, Inc., this company manufactures chains, sprockets, machinery and small tools. They operate a *Twin Beech.* W. H. Whitney is President, Park C. Boyd, Secretary, and Leroy J. Snow, Company Pilot.

Spartan Aero Repair. A division of Spartan Aircraft Company, Tulsa, Oklahoma, and Camden, New Jersey, Spartan Aero Repair has been accepted as an Associate member. This outfit has done a considerable business in the conversion and overhaul of executive aircraft. The company operates a Beech *Bonanza,* a *Spartan 7W* and *Spartan 12,* and will be represented at CAOA meetings by Maxwell W. Balfour, Vice President, Fred J. Tolley, General Manager, Tulsa, and/or Anthony J. Ming, Camden Manager.

Celanese Corporation of America. This company reports a 50-to-100-hour per month utilization of its Douglas DC-3, based at Newark. Howard Zbornick is Chief Pilot. He has an Airline Transport rating.

W. C. Langley & Company. A New York investment banking house, it operates a *Twin Beech,* based at Roosevelt Field. Clement S. Henry is Chief Pilot.

Runway Distance Markers

Capt. Sam Saint of the ATA recently made a good safety suggestion. He says that most professional pilots are qualified to land and take off from a large number of airports. "I counted up to find that I am qualified to carry passengers in and out of 48 different airports . . . Some of the most critical, the most instantaneous decisions a pilot is ever called upon to make have to do with landing and taking off. The most critical factor in these decisions is: How much runway is available? Or how much runway do I still have in front of me? The toughest decisions of all are made when an unknown length of runway is behind us and an unknown length of runway is still in front of us . . .

"It seems clear that a concentrated effort to simplify the pilot's job would result in better airport markings. Lighted distance markers, a sign with numbers on it large enough to read, placed every 500 feet along the runway would certainly increase the safety factor out of all proportion to the cost involved." (Flight Safety Foundation, Accident Prevention Bulletin 50 - 10.)

More on the Airport Gates

Chairman Belden reported that his talk at the meeting of the American Association of Airport Executives at Columbus, Ohio was well received. (A copy of this address was mailed to all members.) After the Belden talk, several AAAE members expressed their appreciation for Mr. Belden's forthrightness and promised to do what they could to improve the airport-gate situation if it exists at their fields. Some AAAE men were concerned to know if their fields were on the "CAOA blacklist" of non-cooperating airports! As a matter of fact, a consensus of member-company pilots' reports indicates not too many offenders, but the few offenders there are have resulted in a great deal of trouble. The airport executives pointed out to Mr. Belden that in some cases the shoe was on the other foot—that the pilots sometimes tie up the gates for an unreasonable length of time, waiting for their passengers, making phone calls, etc. It was agreed all around to work on both sides of the problem. Substantial improvement can be expected in many cases.

Chief Pilot Larry Montigny (of Dresser Industries' Lockheed *Ventura*) is nearly halfway through a "gate problem" survey of the 150 airports he visits. When this is finished, the results will be made available to the CAOA membership.

Regional Groups for CAOA

At a recent meeting of the CAOA Board of Directors, a resolution was passed authorizing the Executive Committee to appoint representatives in various sections of the United States who would act as Regional Directors. These representatives would approach prospective members in their area who might thereafter become members of the Association upon approval of their applications by the Executive Committee.

Such Regional Directors also would hold regional meetings of members from time to time under the direction of the Association. It was felt that in this way much could be done to increase the usefulness of CAOA.

It was agreed that Chicago would be a good center for a start, and that the Chicago Region would include the states of Wisconsin, Illinois, Indiana and Iowa.

Waivers for Certain Airports

Some weeks ago a group of executive aircraft pilots in the New York metropolitan area met at the CAOA field operations office at Mallard Air Service, Teterboro, to discuss the procedure for obtaining waivers in connection with Civil Air Regulations on minimums for landing at airports. George Wies of Sperry opened the discussion by outlining the experimental work his company has been doing at MacArthur Field, Islip, in connection with the Zero Reader.

Officials from CAA's Region 1, Federal Bldg., New York International Airport, then explained the procedure to be followed to obtain waivers for specific pilots, flying specific aircraft into specific airports. Application must be made on Form ACA-400, "Application For Certificate of Waiver." Under the auspices of the local CAA regional offices, blind ILS approaches are shot for each airport mentioned in the application. If the tests are successful, the waivers are issued by the CAA, Washington.

W. R. "Rip" Strong of National Dairy Products was one of the pilots at the meeting whose waivers are now in the mill for La-Guardia, Newark, N. Y. International and Washington National. Al Junker of Bethlehem Steel had previously started the ball rolling, and Ira Hartzog of Irving Air Chute is also working on it. There may be several others. Information on the aircraft, pilots, and airports affected will be published in later issues of the CAOA Directory.

New Directory

The membership drive which began early this year resulted in the sending out of a copy of the *"Directory of Executive Aircraft,"* a Fact Sheet about CAOA and an application blank, to some 750 companies operating multi-engine aircraft in connection with their business. The result of this mailing is a valuable card file index which, in many cases, shows the type of aircraft owned, registration number, name of official handling the aviation operation, chief pilot, etc. Up to mid-May nearly 30 new members have been accepted, and other applications are expected.

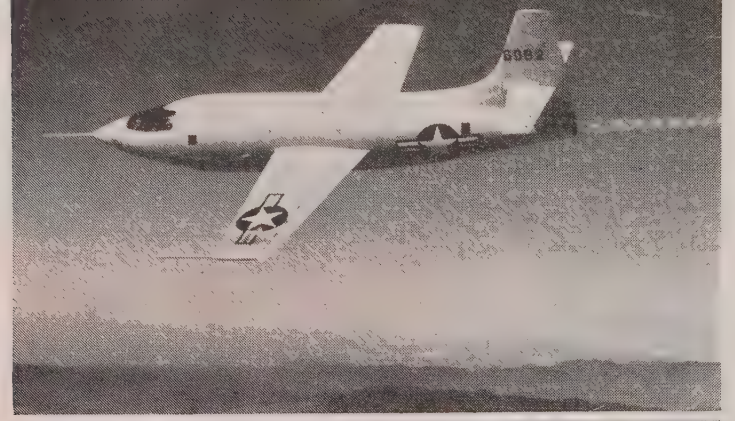
The revised Directory, sometimes referred to as "the Blue Book of Executive Flying," went to the printer in late May, with enlarged company directory section and, in general, more complete information about each member aircraft. The original Directory is in daily use throughout the country and the new edition, due to be distributed in July, should have an even wider usefulness.

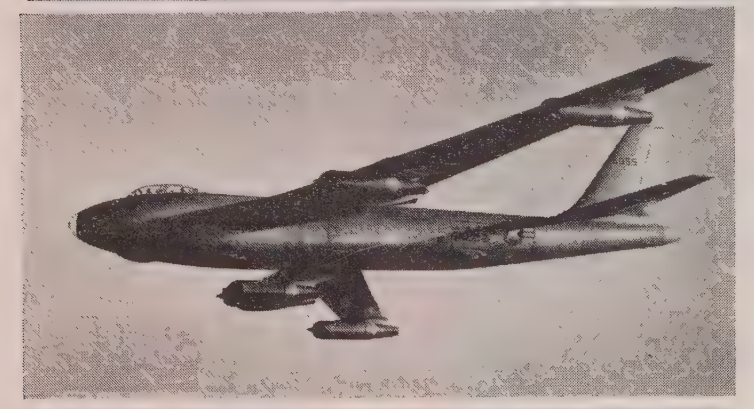
Each CAOA member will receive one copy for the office and one for each aircraft operated. Additional copies will be sent on request.

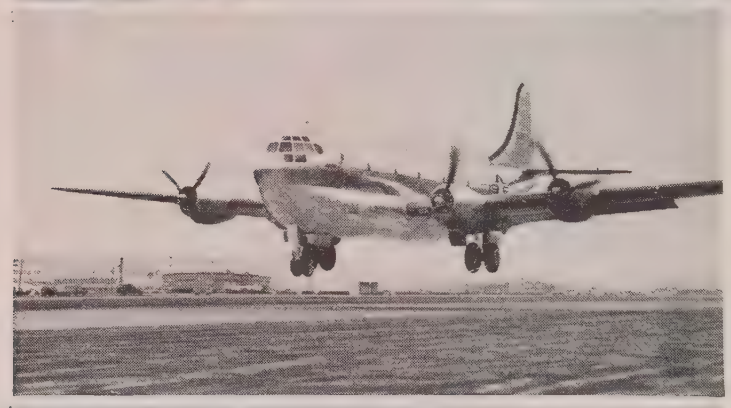
U.S. JET AIR FORCE

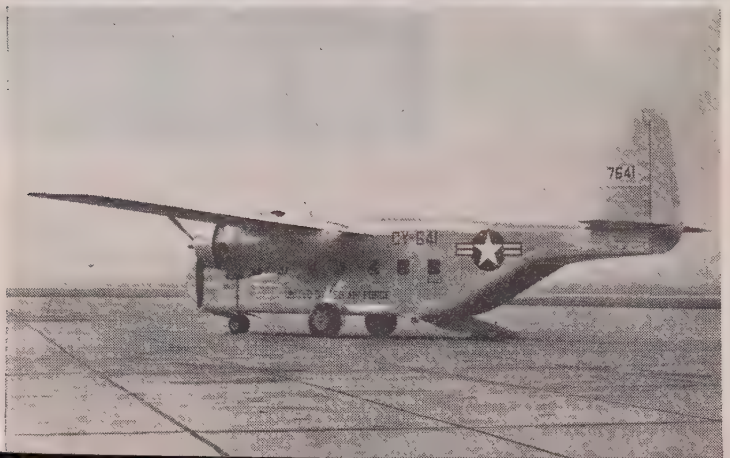
Special Section

The first line of defense is in the air









BELL

BELL X-1 This rocket-powered experimental plane was designed to fly 1700 mph at 80,000 feet. Taking off under own power, it has climbed to 23,000 feet in 1 minute, 40 seconds, and has flown faster than Mach 1 several times. It has span of 28 feet, is 31 feet long, has 4-minute flight duration.

BOEING

BOEING B-47 Called *Stratojet*, this version is powered by six GE J-47 units of 5200 pounds thrust. It is in "over 600 mph class," has cruising range of "over 800 miles." Two new versions are in the offing: one powered by four J-35 units of 9200 pounds thrust; one prop-jet '47 (to be designated YB-56).

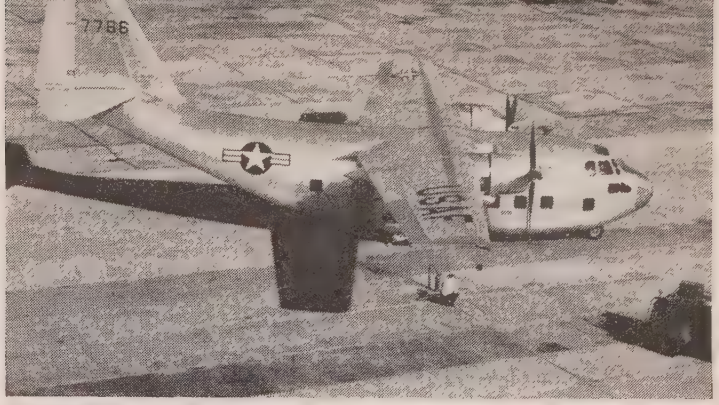
BOEING B-50 This is the postwar version of the famed B-29. Classified as a Medium Bomber, the '50 is powered by four Pratt & Whitney 3500-hp engines which give it top speed near 400 mph with range of 6,000 miles while carrying 10,000-pound bomb load. The B-50 can cruise at 300 mph and has a design gross weight of 120,000 pounds. Carries crew of 11, can be refueled in air.

BOEING YC-97 Air Force cargo carrier is this four-engined *Stratofreighter* designed for high-speed long-range transport of troops or cargo. It is powered by 3500-hp Pratt & Whitney engines, has a top speed of more than 375 mph, and a range at cruising of more than 1100 miles. Range can be increased to 4,000 miles. The *Stratofreighter* carries crew of five; can carry 80 passengers.

CHASE

CHASE YC-122 This cargo or personnel transport is actually a modified glider, CG-18, with engines. Designed to operate out of short fields, it is powered by two 1350-hp Pratt & Whitney engines, cruises at 200 mph with 8,000 pounds cargo, 750-mile range.

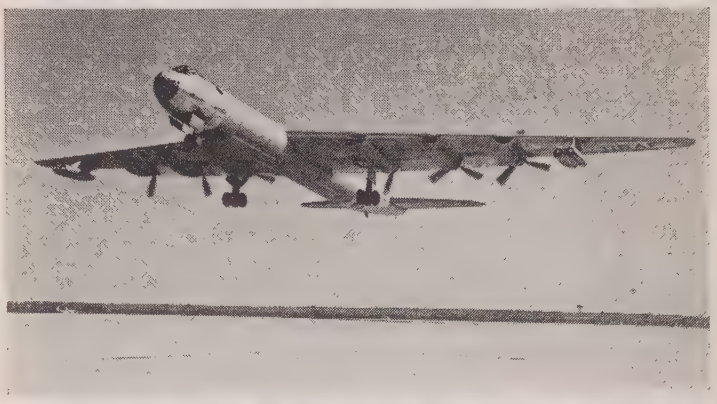
CHASE XC-123 An assault transport designed to carry troops and equipment out of small fields, the XC-123 is powered by two 2100-hp Pratt & Whitney engines, cruises at 200 mph. A complete engine change can be made on this plane in just 45 minutes. It has span of 110 feet, is 77 feet long, and carries a crew of four, 50 litter patients.



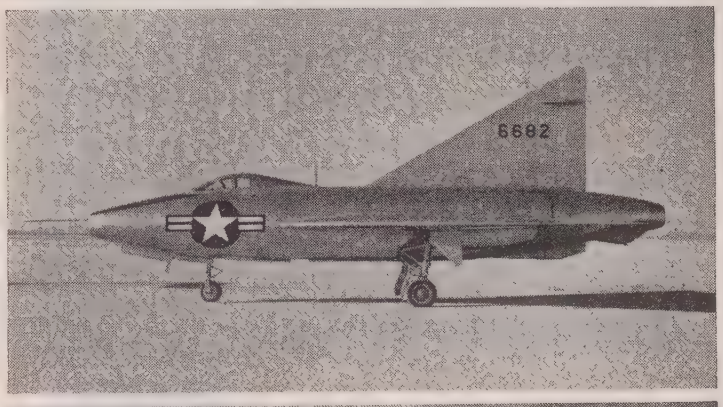
CONVAIR

CONVAIR T-29 A navigational trainer, this high-speed "flying classroom" is an Air Force version of the 40-passenger *Convair-Liner*. It is powered by two Pratt & Whitney 2400-hp engines, has a top speed of more than 300 mph, range of about 2500 miles. Four astrodomes are provided for 14 students and instructors. Bulge under fuselage is a radome. Plane carries a crew of three.

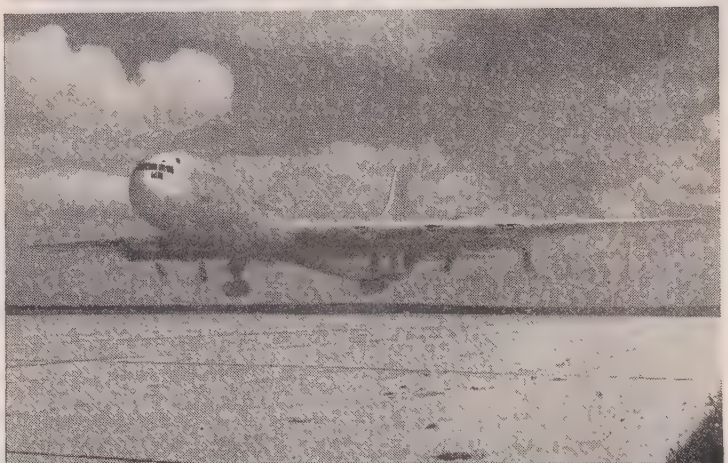
CONVAIR B-36 Classified as Heavy Bomber, the B-36 is one of the most talked about USAF planes. It is powered by six 3500-hp Pratt & Whitney engines plus four GE J-47 jets in pods. It has a top speed of more than 435 mph, can carry 84,000 pounds bombs at reduced range. New versions of the Convair B-36 may be all-jet powered with swept-back wing. It features electronic bombing.



CONVAIR XF-92A The famed delta-wing Air Force fighter, the '92A is powered by one J-33 Allison jet engine of 5200 pounds thrust. It features a 60° sweptback wing. Its speed classified as "high subsonic," estimates put it at about 725 mph. The delta-wing interceptor carries crew of one, has ceiling over 40,000 feet, maximum take-off weight of 30,000 pounds; said to be for research.

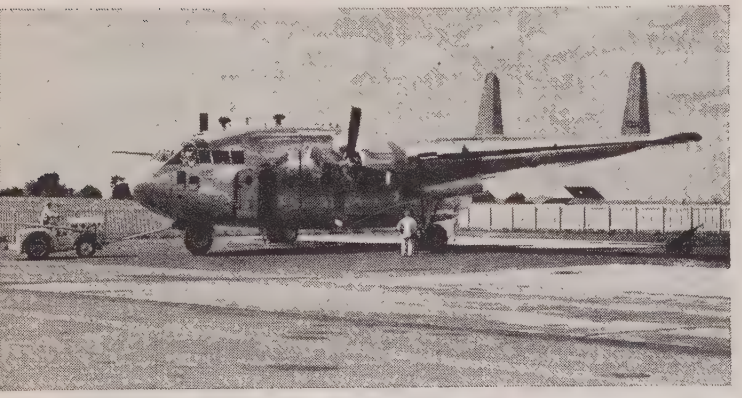


CONVAIR XC-99 A military transport version of the B-36, the XC-99 is called "world's largest landplane." It can carry 400 soldiers. A double-decker, it is powered by six 3,000-hp Pratt & Whitney pusher-type engines which give it a speed of more than 300 mph. It has a fuel capacity of 21,116 gallons, range of 8,000 miles with 10,000 pounds cargo; has capacity of 13,800 cubic feet.



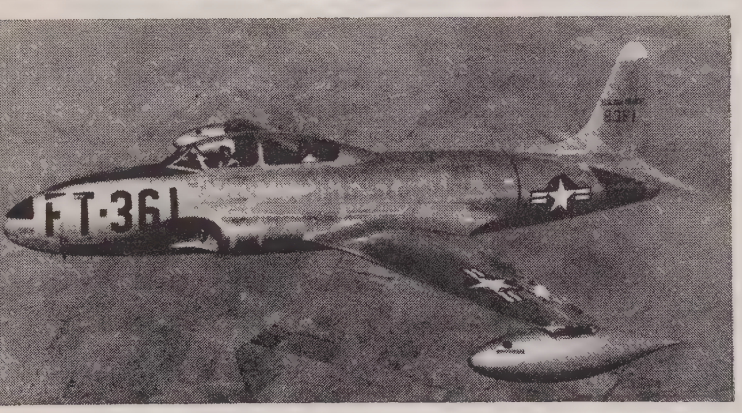
DOUGLAS

DOUGLAS C-124 Called *Globemaster II*, this plane was designed to carry heavy Army equipment. It is powered by four 3500-hp Pratt & Whitney engines, has a top speed more than 300 mph, and a cruising range of more than 1100 miles. With a 50,000-pound load it has range of 850 miles. C-124 can be converted to a two-decker plane.



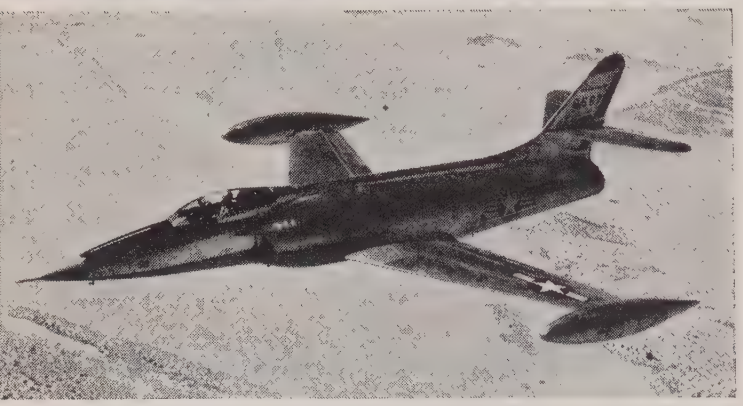
FAIRCHILD

FAIRCHILD C-119 Powered by two 3,250-hp Pratt & Whitney engines, the *Packet* has a speed of "more than 250 mph," and a cruising range of 2,000 miles with a nine-ton load. It has cargo capacity of 3,000 cubic feet, carries 2700 gallons of fuel. C-119 is improved version of C-82. The plane may be equipped as a troop transport, litter carrier.



LOCKHEED

LOCKHEED T-33 Training version of the famed F-80 *Shooting Star*, the T-33 is a dual-control jet ship powered by an Allison J-33 jet unit of 5200 pounds thrust. The trainer is 36 inches longer than the F-80. It has speed of 600 mph, and a range of more than 500 miles at cruising speed. It is equipped with ejection seats, two 1,000-pound RATO's.

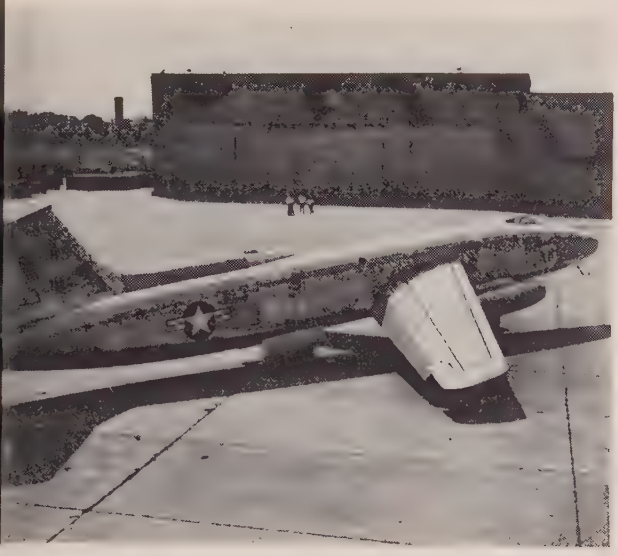


LOCKHEED XF-90 A needle-nosed jet penetration fighter, the XF-90 is powered by two Westinghouse J-34 jet engines of 4,000 pounds thrust each. Speed of this jet fighter is classified, but estimates put it at Mach 1. The plane has a maximum take-off design gross weight of 30,000 pounds; has 35° swept-back wings, pilot ejection seat. Design of the F-90 was begun in 1945; plane first flew June, 1949.

LOCKHEED F-94 The Air Force is changing the designation of the F-94B to F-97. An all-weather night fighter (F-97), it is powered by a Pratt & Whitney J-48 engine of 8,000 pounds thrust with afterburner. It is a two-seater capable of Mach 1 speeds, with range over 500 miles. Pilot of the F-94 occupies front cockpit, radar man sits in the rear.

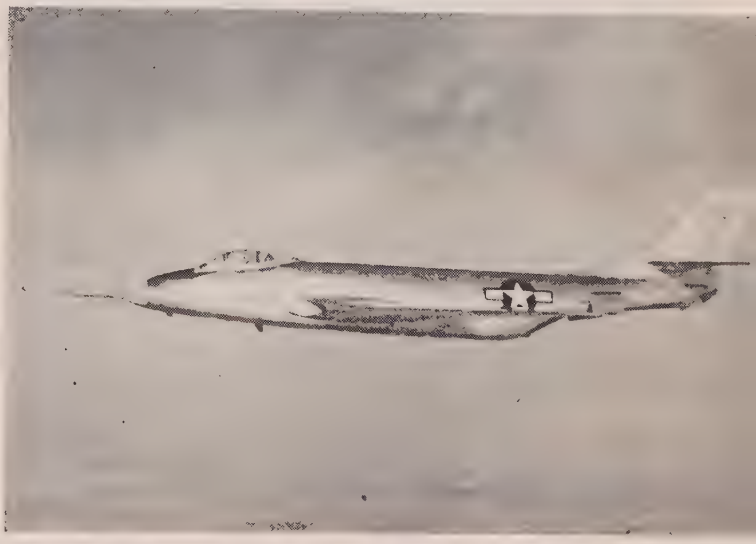
MARTIN

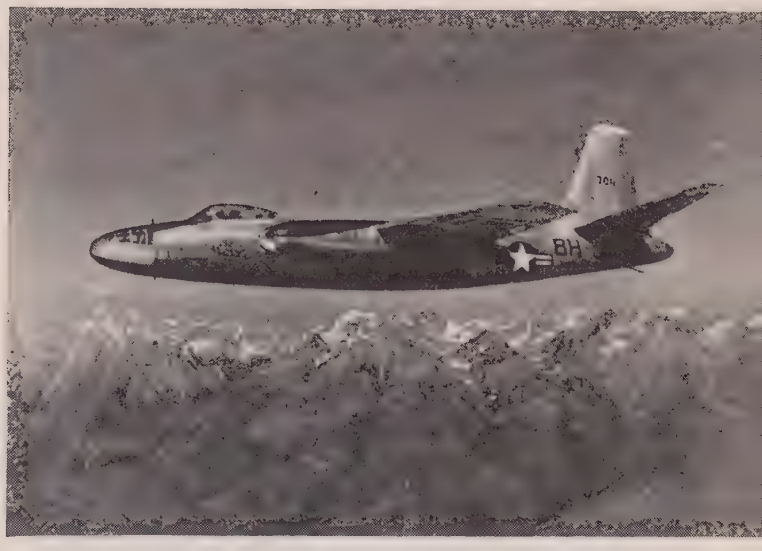
MARTIN XB-51 Called a Light Bomber, the XB-51 is high-speed ground-support ship powered by three GE J-47 jets of 5200 pounds thrust each. It carries crew of two, has cruising range less than 1,000 miles, is equipped with RATO (Rocket-Assist-Take-Off) for short-field operation, and parachute deceleration on landing. The '51's cabin is pressurized.



McDONNELL

McDONNELL XF-88 Another penetration fighter, the XF-88 is high-speed single-seater powered by two Westinghouse J-34 jet engines of 4,000 pounds thrust. It features 35° sweptback wings, pilot ejection seat. The '88 has a maximum take-off gross weight of about 30,000 pounds. The XF-88 has a span of 40 feet, is 55 feet long, 15 feet in height.



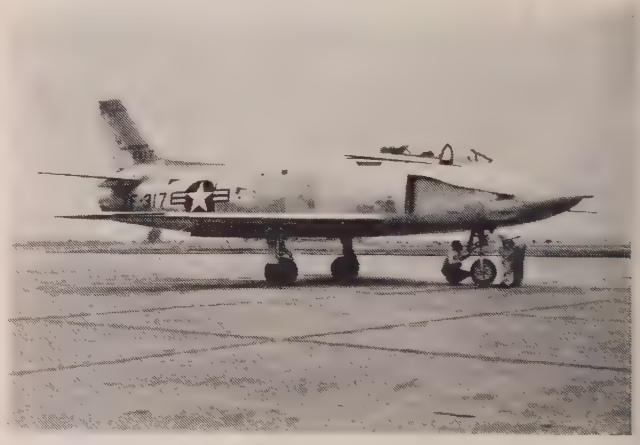


NORTH AMERICAN

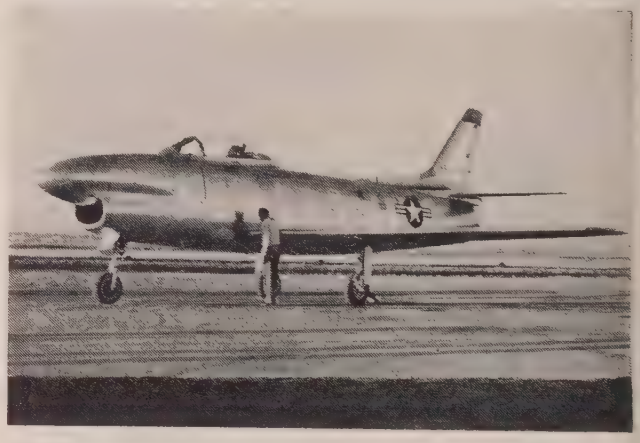
NORTH AMERICAN T-28 In the Advanced Trainer category, North American has the T-28 powered by an 800-hp Wright engine. It has a range of about 1,000 miles and a top speed of more than 280 mph. It has a rate of climb of 2,570 feet per minute, and a retractable tricycle landing gear. It has a span of 40 feet 2 inches, is 32½ feet long.

NORTH AMERICAN B-45 Another Light Bomber, the B-45 is powered by four GE J-47 jet engines of 5200 pounds thrust, arranged in pairs in single nacelles. Called the *Tornado*, it carries a crew of four, has maximum gross take-off weight of 110,000 pounds, is said to be in the 550-mph class and to have a cruising range of over 800 miles. It is capable of carrying a bomb load of over 20,000 pounds. The *Tornado* also is equipped to carry 4,000-pound RATO units for short take-off.

NORTH AMERICAN F-86 The *Sabre* is one of the fastest fighters in the USAF line-up. Powered by a GE J-47 jet engine with 5200 pounds thrust, the *Sabre* is in the "over 650 mph class." Unofficial estimates credit the *Sabre* with a speed of "more than 700 mph," and a range "of more than 500 miles." It has a service ceiling over 45,000 feet. The F-86 has a wing and tail sweepback of 35°, a tricycle retractable landing gear and a steerable nose wheel. Thus far five Air Force Groups have been equipped and two more are being equipped.



NORTH AMERICAN YF-93A A penetration fighter, the YF-93A is powered by Pratt & Whitney J-48 turbojet (6,250 pounds thrust) with afterburner. Designed for extremely high operational speeds that exceed the speed of sound (660 mph at 35,000 feet), the YF-93A features sweptback wings and a "Coke bottle" fuselage. The YF-93A has a service ceiling estimated to be "over 50,000 feet."

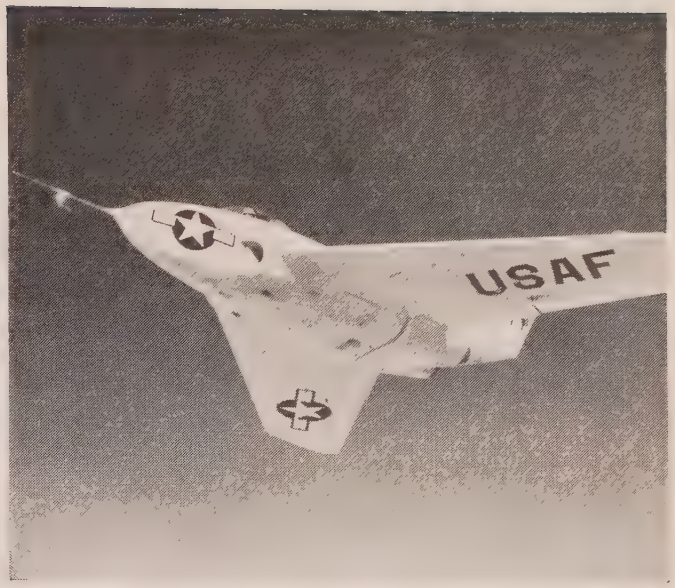


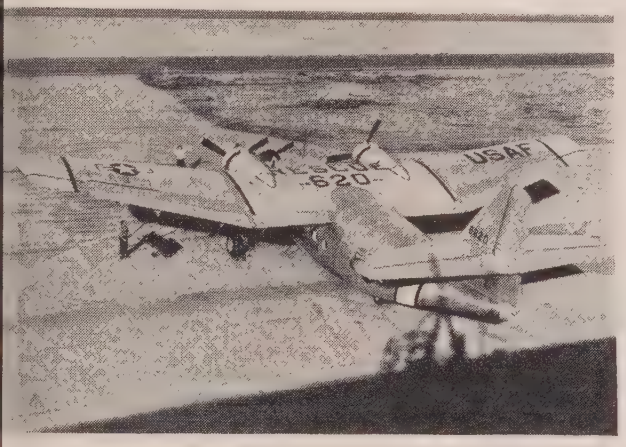
NORTH AMERICAN F-95 A high-altitude interceptor, the F-95 is a modified version of the F-86. Retaining the general configuration of the *Sabre*, the F-95 is powered by a modified General Electric J-47 jet engine with afterburner, and is said to have speed in "650 mph plus class," a service ceiling of more than 45,000 feet. The F-95 formerly was designated YF-86D. Main difference between F-95 and the YF-86C (F-93A) is the relocation of its intake.

NORTHROP

NORTHROP XF-89 The all-weather *Scorpion* is a radar-laden fighter capable of speeds well above 600 mph. A successor to the famed F-61 *Black Widow*, the XF-89 is powered by two Allison J-35 engines, 5,000 pounds thrust. It has a cruising range of more than 600 miles and a service ceiling above 40,000 feet. Complex electronic equipment enables *Scorpion* to penetrate darkness. It carries crew of two, features crew ejection, pressurized and refrigerated cockpit, plus radar.

NORTHROP X-4 A flying-wing type research plane, the X-4 is the fourth in a series of "X" ships ordered by the Air Force. The X-4 is powered by two gas turbines and was designed for subsonic speeds. Purpose of this single-place X-4 is the investigation of stability and control of this type aircraft at high subsonic speed. The "X" family began with the Bell X-1, continued with the highly secret Bell X-2, Douglas X-3, and this, the Northrop X-4. The X-4 features a sweptback wing, tricycle landing gear and pilot's ejection seat; is not production ship.



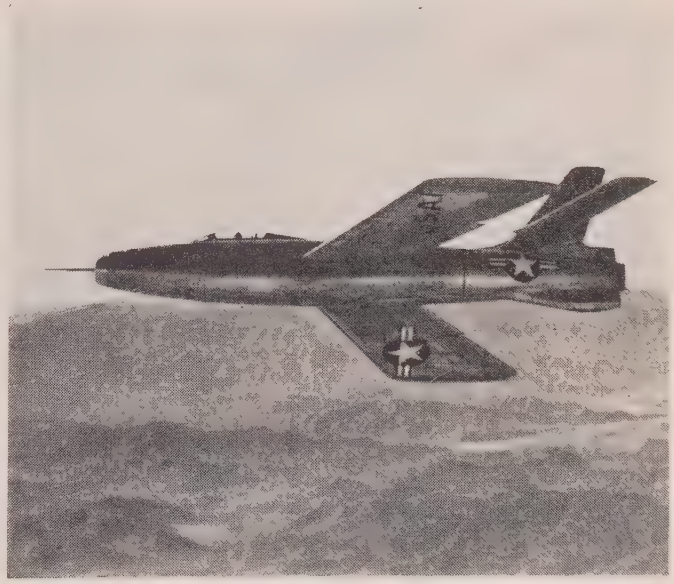


NORTHROP C-125 The *Raider* is designated as a Light Assault Transport. It is powered by three Wright 1,425-hp engines and has a cruising range with 15,000 pounds of cargo of over 850 miles. Its maximum cargo capacity is 20,000 pounds. The *Raider* is credited with a top speed of "more than 225 mph," and a ceiling of 25,000 feet. The C-125B is designed for Arctic rescue; is equipped with floats.

REPUBLIC

REPUBLIC F-84 Called the *Thunderjet,* the F-84 is powered by J-35 engine of 5,000 pounds thrust, has top speed "over 600 mph." External fuel tanks increase its radius of action from 850 to 1,000 miles. F-84E is armed with six 50-cal. guns, carries rockets.

REPUBLIC XF-91 The Air Force's new high-altitude interceptor is the XF-91 that is powered by a J-47 jet engine of 5200 pounds thrust, four rocket motors, and an afterburner. Estimates credit the XF-91 with a speed of Mach 1, and a service ceiling "above 60,000 feet." Design feature of the high-speed jet is its extremely thin wing of inverse taper. It has a tricycle gear, with main gear in tandem, and a pressurized and refrigerated cockpit. The XF-91 carries a crew of one, and has an extremely high rate of climb. It may be called *Thunderceptor.* The inverse taper of the F-91's wing, combined with leading edge slots makes possible flying at a speed lower than possible with other jet fighters.



The Snorkel Sniper

(*Continued from page 11*)

a lot of things about the *Neptune* before they bought it. For the past four years, my job has been to answer those questions. It took six weeks of storm chasing all over the country to answer the query, "Will it carry a load of ice?"

We took a seven-man crew out of Lockheed and chased every storm front that showed up on the weather map. We flew to Denver, Dallas, Patuxent, and then out over the North Atlantic to Nova Scotia and a dot on the map called Sable Island. I flew 80 hours of actual instruments in six weeks—never took off when the weather was good—and finally we found the ideal icing condition over Spartanburg, South Carolina.

To pick up a heavy load of clear ice, you must have a temperature inversion (cooler on the ground than at altitude) with a light rain drizzle. Over Spartanburg, the air up to 1,000 feet was between 26° and 28° F, and from there on up it was over 32°. Moisture that was falling from this warmer air into the cold air wouldn't freeze until it hit an object and then—Oh Brother!

We had 3 or 4 inches of clear ice on the windshield quicker than I've ever seen it form before, even though I was once an instrument instructor for Western Airlines. But that was the stuff we were after, so we cruised at 160 mph for nearly two hours, back and forth for 20 miles on the Spartanburg radio range.

When we went into this heavy icing layer, we were pulling 700 hp per engine. After two hours in it, we had increased our power slowly to 1450 hp per engine. Before we were finished, we had a considerable ice load on the ship itself, yet no ice formed on the heated leading edge of either the wing or tail.

I made one pass at the Spartanburg Airport because we wanted to get a set of pictures showing where the ice was forming on the airplane. The ceiling was 400 feet, and the runway was only 4200 feet long. The early model that I was flying at the time did not have reversible props, so we didn't land. Finally I climbed back up to 3500 feet where the 35° temperature melted off all the ice.

The ice tests on the *P2V* were not just to check the handling of the airplane with a truckload of ice aboard. We were also interested in radio reception, powerplant and propeller operation. Bare wire antennas were found to be practically useless except for VHF transmissions. During the first flight in icing conditions, the vertical antenna lead-ins were carried away because they picked up too much ice. When the lead-ins were sloped forward, the problem was solved.

This anti-icing research paid off well two years ago when the Navy took six *Neptunes* to map 30,000 square miles of Alaska. The only other photographs of the area had been made back in the late '20's from two Loening amphibians. When bad weather cancelled landings at Ketchikan, the range of the *P2V's* made landings possible at any of several Southern Alaska fields.

That was just one phase of the flight testing of the *P2V*. The beating that the *Neptune* took on some of those Navy demonstrations was out of this world—and the ships are still taking it.

The *P2V4* is a big airplane. The wing span is an even 100 feet and normal gross take-off weight is 67,500 pounds. For a ship only 10 feet larger than the DC-3, the *P2V* will walk off the ground with two-and-one-half times the load. Gross take-off weight on the "Truculent Turtle" was 85,000 pounds—and that's a lot of weight for a twin-engined airplane.

There's a new engine in the making for the *Neptune*. It's a Wright R-3350-30W compound engine that will materially improve the range of the plane. This compound engine picks up an added 20 per cent in power by having the thrust from the exhaust gases fed back into the engine through a fluid drive clutch.

Recently, we ran a series of landing tests to prove just how much of a beating the big plane's gear would take. Specifications were set up for 40 landings with the airplane touching the ground at a descent rate of nine feet per second; that's 540 fpm. To make such tests, we set the airplane up for a landing way back off the end of the field and check the rate of descent with a stop watch by holding a constant 120 mph and reducing power until the ship is dropping correctly. Then we head for the home airport, come in at 120 mph and reduce power to the previous setting. You just sit there and hold a constant airspeed. When that big airplane slams into the ground, you're sure something will let go. It feels just like a controlled crash.

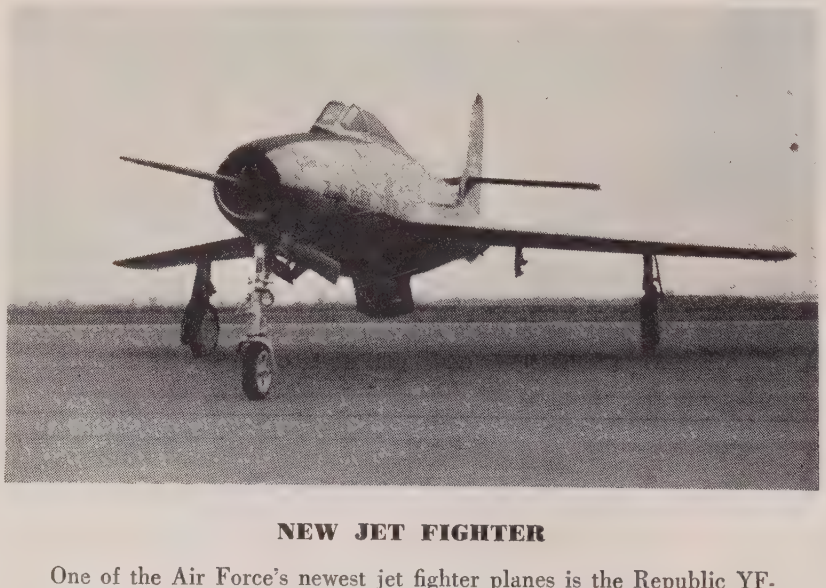
Demonstrating this big blue airplane is a real pleasure. I usually make a short take-off, feather one engine and climb out single engine. I fly it around and show all the maneuvers, including acrobatics, that the ship will do.

Bob Middlewood, *Neptune* project engineer, and Bob Bailey, project director of the Navy research group, have done a fine slide rule job on this ship. There isn't a test pilot in the business who doesn't give all the credit in the world to the boys in the back room of the engineering department. The way they've worked out this trick elevator is a honey. The *Neptune* has a short, stubby elevator with three movable sections. The front section is fixed rigidly to the fuselage for strength. Then the center of the elevator is hinged and attached to an electric trim tab in the cockpit. This center "varicam" (variable camber) unit works just like a trim tab, yet furnishes a high-lift tail that makes for great tolerance in loading. The elevator is conventional and equipped with a servo-tab for light control pressures. In designing this "varicam" stabilizer control, the engineers saved 20 per cent of extra span and a substantial saving in weight.

All the controls on this ship are aerodynamically balanced. The rudder is big—18 per cent of the wing area—to provide twice the directional stability of most twin-engined aircraft. That billboard fin area is a great help in case of an engine failure, and results in almost no yaw on the *Neptune*.

On any big airplane with only two engines, a great deal of flight-test time goes into the question of "what happens if you lose an engine on take-off?" For full-gross take-offs with an actual feathering just as you break ground, we went to Muroc Dry Lake (Edwards Air Force Base) and took off out over the eight-mile dry lake just on the chance that the ship would go back into the ground. It never did, and we were always able to get the gear up and go right on upstairs even with one of those big fans full feathered.

On any engine failure on take-off, the critical point is just after take-off before you have had time to get single-engine flying speed. For that reason, I make it a standard practice to let the airplane roll along flat until I've picked up a speed at which I know the airplane will fly on one engine. There's less drag that way than to pull the nose wheel off the ground at the beginning of your take-off roll and have all that wing angle to slow you down. Once I've picked up flying speed I ease back on the wheel and let the ship



NEW JET FIGHTER

One of the Air Force's newest jet fighter planes is the Republic YF-96A, a swept-wing version of the famed F-84 *Thunderjet* fighter-bomber. The YF-96A is powered by a new version of the Allison J-35 turbo-jet engine, and its design performance figures exceed those of the F-84E. The Air Force now has the '96A for evaluation tests at Edwards AFB.

ake off. Then the gear comes up at once so hat the ship will accelerate to single-engine peed just as quickly as possible.

During early propeller-vibration tests, the ngineers asked for as much yaw as possible t 255 mph. A 300-pound rudder pedal force as applied mechanically—and bang! Some-hing let go and the ship continued to yaw. When we got the ship back in level flight, e headed for Edwards AFB and made a ingerly landing.

The leading edge of the vertical fin was nissing, the right bomb door was gone and he rear part of the fuselage was so badly wisted that a number of frames failed. Nat-rally, the structure was subsequently beefed p, and we've had no more trouble with the hip.

In moments like that, a test pilot earns is pay in a hurry. When anyone begins to ib me about my new Cadillac, I remind hem of that. Personally, I believe that test lying big airplanes is more hazardous than esting fighters.

Bob Middlewood, the project engineer, has novel definition of this engineering test-lying business. "It's just like leaning out f a 20th story window," says Middlewood, to see how far out you can go. With engi-neering test flights, we are trying to see just ow far we can go without going too far. t's actually a carefully controlled 'leaning ut the window'."

However, when you have faith in your en-gineers, you don't worry too much about iliving the airplane to maximum speed—let's ay around 375 mph at a gross weight of 34 ons and pulling 2½ G's followed by full ileron, throwing the ship into a tight climb-ng turn.

This airplane was not designed for carrier peration, but with the aid of JATO, a *P2V* with a gross weight of 75,000 pounds ook off from the aircraft carrier *Coral Sea*. ince that time, more than 100 take-offs have een made from Navy carriers. Without ATO the ship will get off the ground in less han 2500 feet with a heavy load at sea level.

Landing roll is equally short. Since the talling speed is about 75 knots (84.5 mph) ower-on, a very leisurely approach can be nade. I make all my approaches within 10 knots (11.5 mph) of stalling speed. The hip gives such a good natural stall warning hrough a good-natured buffeting that we've never bothered to add a mechanical stall-warner in the cockpit.

Just as the wheels touch the ground, re-verse power is applied and the *Neptune* real-y comes to a stop in a hurry. I can get as rapid deceleration in the P2V4 just as it ouches down by reversing the props and pouring on 50 per cent power as I can by applying all the brakes that the ship will take without skidding the tires. On any air-plane, once those tires begin to skid, your braking efficiency is all gone. I brought a group of pilots in from Palmdale one day when the weather was badly "socked in" here at Burbank. We came down on a low instrument approach and I poured on re-verse power as soon as the wheels touched the ground. We turned off at the runway in-tersection without using any brake. But in normal operation, the reverse thrust of the props is most effective at higher speeds and drops off materially as soon as the speed comes down below 40 mph.

The reverse-power controls are the same at the forward controls and are pulled back to add power. This reverse thrust will operate only after the gear is on the ground and a solenoid switch on one landing gear strut is closed by the weight of the airplane. I landed into a 20-mph wind in 400 feet at Santa Rosa one day.

These hydromatic reversible props go past dead-center so rapidly that there is no possibility of over-speeding the engine. I make it a practice to back the airplane into its parking space at the factory after each flight.

TEST EQUIPMENT for recording landing gear shocks was mounted on the P2V4's gear

This *Neptune* is strictly a one-man airplane. While there is a seat for a co-pilot and a bunk for crews to stretch-out on long flights (the ship has enough fuel for 36 hours in the air at economy cruise), the pilot in the left seat can reach all the engine and flight controls. Here at the factory, we don't hire any co-pilots for test work. Rudy Thoren, director of flight-test engineering, as well as our flight-test engineers frequently ride the right seat on any extensive tests. Thoren made all the observations on the icing tests.

When I have a long cross-country trip in the *Neptune*, say from Burbank to Washington, D. C., I always fly at night on an instrument flight plan. Actually, I'd rather fly this airplane on instruments than contact. It takes more precision and keeps you on the ball to hit your check points on the money when you're working out there at night than it does on a sunny summer's afternoon.

Probably the reason that I work hard at my precision flying is that I originally learned to fly on my own dough. I worked at Lockheed for five years as a flight-line mechanic, and then in 1940, went out and bought enough flying time for a license. After that, I went to work teaching British students at Lancaster in PT's, BT's and AT-6's. After a year of that, I had 1500 hours total time, including an instrument rating and 200 hours of instrument instruction time. Then I went to Western Airlines as an instrument instructor and later to Martin Aircraft as a B-26 production pilot. Finally, I returned to Lockheed as a production pilot and worked into the F-80 flight-test program. The difference between a production pilot and an engineering test pilot is that the engineering test pilots fly a new airplane first; production pilots fly test hops on all production planes before they are accepted by the customer. In engineering test flying, you're working with the first brand-spanking new model that's fresh off the boards.

The *Neptune* has been designed with two thoughts in mind, aside from the flight characteristics, that is. The ship can be built quickly—and it is easily maintained in the field once it is in operation.

The fuselage, for instance, is built in six sections that are bolted together. All equipment except the control system can be placed in each section before assembly. Plumbing and ducting have disconnect fittings where the fuselage sections are bolted together. The leading edge of the wing, all the way out to the tips, is removable and the wing is designed to provide temporary flotation in case of a water landing. Heated leading edge de-icing is built into both the wing and tail sections with four 200,000 BTU combustion heaters supplying the power.

Without going too deeply into the nebulous subject of advanced aerodynamics, the wing of the *Neptune* proves out as a wonderful unit. The airfoil is a modified old-fashioned section with the thick point of the wing moved 8 per cent aft to reduce drag.

In-the-field maintenance on a tactical aircraft like the *P2V* always has been a headache. The design section put a lot of thought into whipping this maintenance problem and now you can change an engine on the *Neptune* in just 30 minutes. The engine mounts are semi-monocoque and the complete unit, including the accessory section, comes out at one time. A propeller can be pulled and replaced in 22 minutes and a complete outer wing panel can be changed in 85 minutes.

The six 20-mm nose guns, fired remotely by the pilot, are placed for easy servicing. The nose access hatch is hinged and swings upward. Maintenance crews can stand on a platform over the guns for re-loading.

While it isn't a supersonic fighter, this big *Neptune* is an important aircraft in the scheme of things when so much emphasis has been placed recently on anti-submarine control. Top U. S. scientist, Dr. Vannavar Bush, says that the snorkel sub is as much to be feared as any weapon in the arsenal. "They are able to stay submerged for long periods of time," he explained, "with only the small end of a pipe (the snorkel) sticking out like a swimmer breathing through a straw." They have sufficient speed to overtake slow convoys and have defied the ability of airborne radar to detect them while running with only the snorkel above the surface of the water.

That's the specific problem that the *Neptune* has been built to handle. Actually, the *P2V4* is a long-range radar platform with enough armament in guns, bombs and rockets to put a sub out of business.

I checked out the first six Navy crews that took delivery of the *Neptune*, including the pilots that made the record hop in the "Truculent Turtle." They're a sharp bunch of boys who know their way around. If it were snorkel sub vs. *Neptune*, I'd much rather be in the *Neptune*.

Pilot Report...Navion

(*Continued from page 16*)

engine is run-up, yet there is no noticeable vibration. The propeller is a Koppers hydraulic with a vernier pitch control located just to the right of the throttle. This prop is 93 inches in diameter, nine inches longer than the prop on the older model.

Magnitos are checked at 2500 rpm and the engine turns 3400 on take-off. The engine operates on 91 octane fuel and has a low-pressure (½ to 5 pounds) fuel pump. Sloan advised fairly close attention to the carburetor-heat control.

For demonstration purposes, Sloan made the first take-off. The ship accelerated very rapidly and we had an indicated rate of climb of 1200 feet per minute as soon as the gear came up. We climbed out through the ever-present haze and headed east. With three of us in the plane, 52 gallons of gas aboard and full climbing power—25 inches of manifold pressure, 2900 rpm's and an indicated 100 mph—we climbed to 5,000 feet in six minutes, and to 10,000 in 13 minutes and 35 seconds. There were no thermals or rising ridge currents.

The head temperature gage, red-lined at 210°C, read between 180° and 185° throughout the climb. This instrument is connected with the hottest cylinder head, number five on the rear of the right bank.

Cowl flaps are standard equipment and should remain open during climbs. The cowl-flap handle is located just below the prop control and serves as a reminder for the pilot to keep his flaps open during the climb, since the handle must be pulled out about four inches to close the flaps. As the flaps are closed, the ship becomes slightly tail-heavy and should be re-trimmed. These cowl flaps are quite large and slow the ship down about 5 mph, so they should be closed as soon as possible after reaching cruising altitude. The head temperature gage will tell you when.

New on the 1950 "260" is a small ventilation scoop in the top of the hatch aft of the rear seat. This little air outlet improves circulation at least 50 per cent and is available in kit form for older models. A cowl-flap kit is also on the market.

"Please mention that there is no conversion kit as yet planned for this 260 engine," said Sloan. "Since Lycoming is just beginning to produce this new unit, all their engines for at least the next year are committed to the *Navion* and the six-place *Twin Bonanza*. A cost analysis showed that a conversion kit would be nearly $6,000 including the new powerplant."

As we approached Big Bear at 10,000 feet over Lake Arrowhead and the Rim-of-the-World highway, we saw an unseasonal late spring snowfall on the ground.

"Perhaps we won't be able to get into the Big Bear Airport," said Sloan as we neared the lake. Our corrected airspeed at 10,000 feet was 167 mph with 2700 rpm and 20 inches of manifold pressure. The outside air temperature was plus 8°C. Cabin heaters and mufflers are now standard equipment on the "260."

The runway at Big Bear was muddy and crisscrossed with narrow patches of sloppy snow. We let down and dragged the strip twice for a closer inspection. The flight strip was definitely in poor shape.

"Don't take the *Navion* into that sloppy strip if you don't want to," we told Sloan. "There's no percentage in getting the ship all muddy. If it doesn't look good to you, let's go somewhere else."

"I think if we land in the first quarter of the runway, we can miss most of the mudholes," said Sloan as he dropped the gear.

We circled wide around the field, dropped the *Navion* flaps all 43° and slowed up for a long straight-in final approach.

There is no fence surrounding the Big Bear field, so we touched down in the warm-up circle with the elevators all the way back. Our indicated airspeed was 55 mph.

Sloan pulled on the brake handle as soon as we touched and the big 7.00 x 8-inch tires bit into the spongy ground. We plowed through two soft spots that slammed mud against the bottom of the wing and spattered the windshield with dirty snow as we slid to a stop. We turned off on a taxi-way barely a thousand feet down the runway.

A closer inspection showed the airport to be quite soft and muddy in spots, but Sloan agreed to make one pass around the field for picture purposes, so he and Libra taxied out for take-off.

Because of the poor condition of the runway, the *Navion* slowed perceptibly twice during its take-off when it plowed through mud and soft snow. Yet the take-off was made in only 17 seconds.

Sloan flew the pattern and landed. Then he climbed over into the right seat and said, "It's all yours. I got it out of here once. So can you."

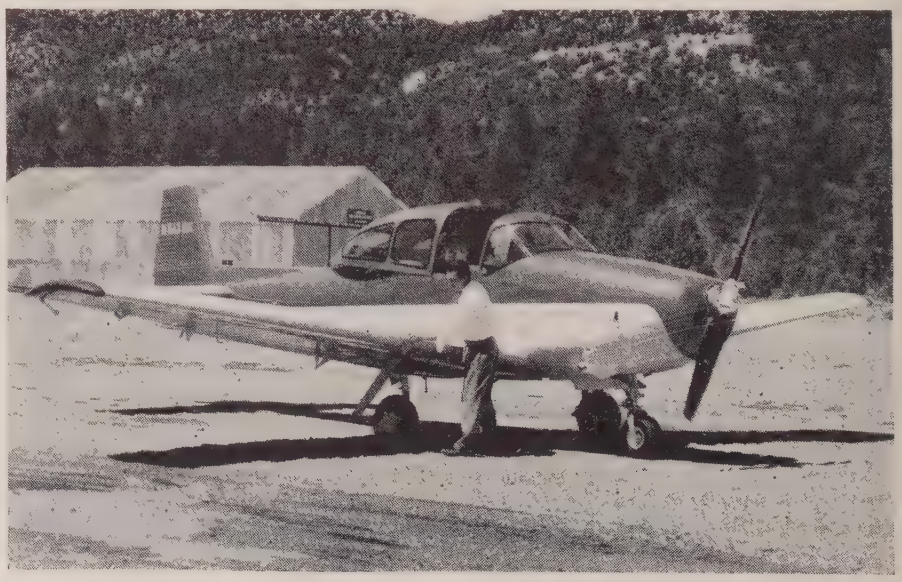
We climbed in behind the controls and started the "260." As we taxied out, we could feel the drag of the gear as it passed over the snow and mud. Run-up was simple. We checked the mags, prop control, trim-tab and

(*Continued on page 42*)

An Old Timer

Still flying on West Coast is this Prest *Baby Pursuit*, and it's probably the only one in existence. A single-seater, it is powered by a 1919 60-hp three cylinder Lawrence engine. Plane was bought by its owner 11 years ago for $100.

BIG BEAR AIRPORT was muddy and partially snow-covered. After landing there, Doc Sloan had to get out and wipe the mud off the new green-and-ivory *Navion's* wings



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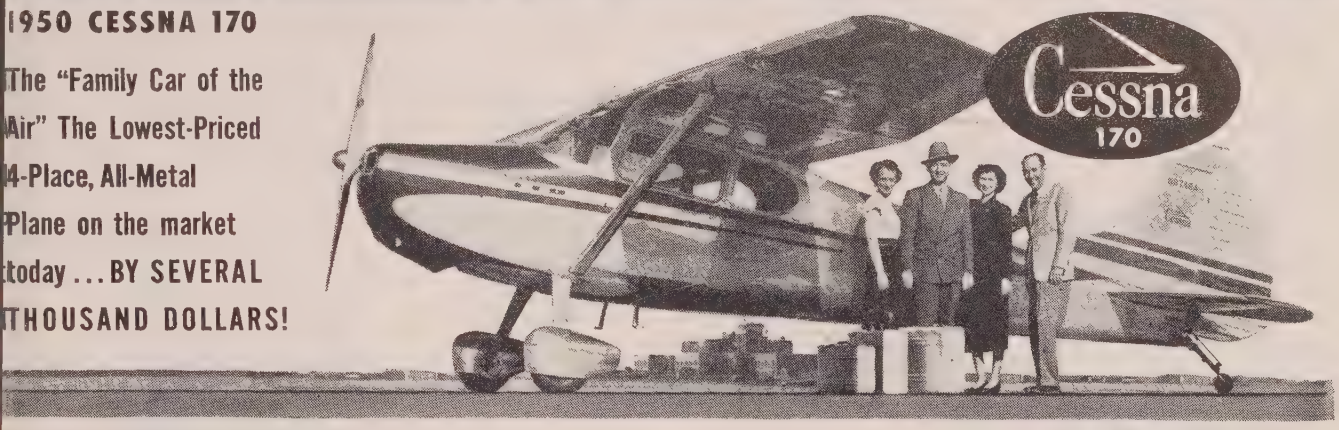

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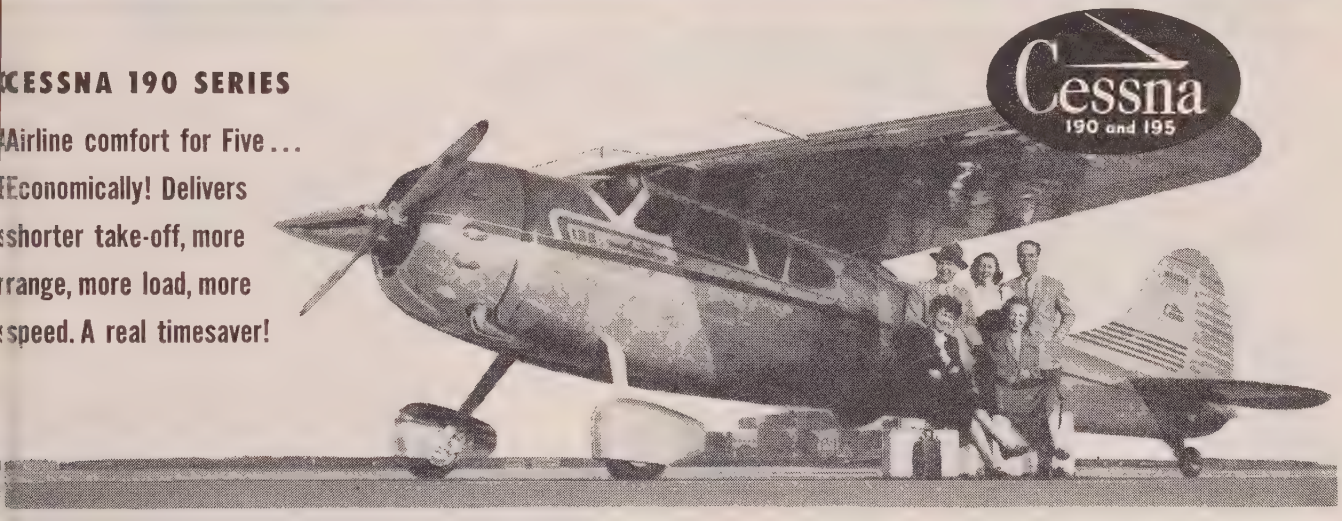

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Dilbert

(*Continued from page 26*)

—after an extra long run. On his first turn, however, all his extra power wasn't enough. The plane fell off on one wing and crashed. As he crawled clear, he could see it wasn't worth patching any more.

Dilbert claimed this crash was "just tough luck." With only a wisp of brain, however, he should have known that it takes more than pilot technique to fly a plane with badly damaged wings. He should have let an engineer decide on the flight characteristics of his altered airfoils, instead of attempting to find out by experimenting. He should have realized that a plane temporarily grounded for repairs is worth a dozen permanently grounded by unnecessary crashes.

Not Dilbert. He had a girl back in Podunk!

Too Late—Everything had been normal throughout the flight. Here's the pilot's explanation of what happened when he came in to land:

"When I applied throttle after obtaining 18 inches of manifold pressure, it went the full length of the quadrant with no response from the motor. By then I was almost in position for a normal landing, but when I eased the throttle back, the engine did not cut. I knew immediately that the throttle control rod must have become disconnected.

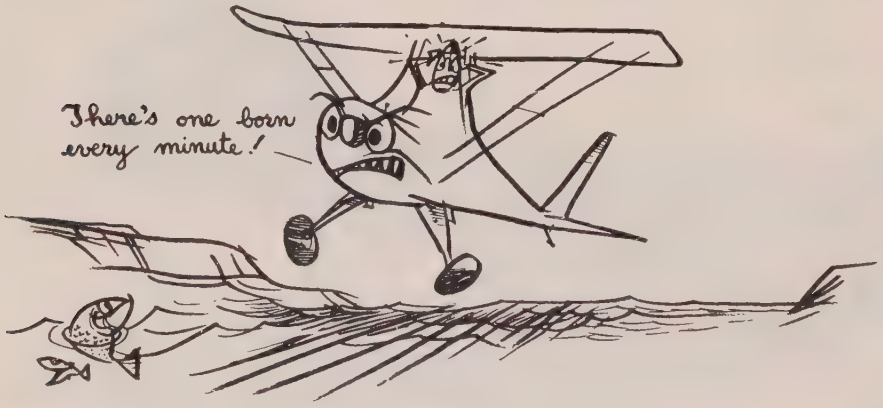
In the dim light, he overshot his landing (5800-foot runway) and ended up in a drainage ditch bordering the field. The pilot wasn't seriously injured, thanks to his safety belt, but the plane looked like a collapsed accordion.

Most pilot-error accidents are caused by errors of technique, judgment, or just plain carelessness, but this one involved all three —plus the basic cause of disobedience of regulations.

You see, Dilbert had filed his clearance for another field, but elected to continue on without reporting his change of plans. That's why this airport had no word of his expected arrival.

Now it so happens that this particular field is always closed between 6:00 P.M. and 8:00 A.M., unless prior notification of an expected flight is received. Of course, all information about this field is available to anyone interested enough to look it up.

So, to the other causes of this accident, just add "culpable ignorance."



"Strangely enough, the first thing that flashed into my mind was that I would overshoot the field, or go over on my back when trying to brake it down after landing. Automatically, I eased over to the right to land in the river which paralleled the runway. Just before I hit it dawned on me that simply by cutting the switches I could have made a normal landing on the field. I screamed in anger, but *it was then too late.*

"I made a full-stall landing and reached shore about the time the plane sank. When I saw the crash crew coming, I was so embarrassed and upset by my stupidity that I wished I had gone down with the plane. Maybe some mech *was* responsible for that throttle-rod failure, but that was no excuse for my dumb reaction to the emergency."

M. T. Head—This Dilbert arrived at an airport just before dark and circled the field, calling for landing instructions. Receiving no answer, he attempted to land without clearance from the tower. Oh, yes, and without field lighting.

Brake Technique—Do you have continual trouble with your brakes? If so, you're probably one of the many who unnecessarily drag their brakes while taxiing, who use them consistently to speed up turns and to stop their planes quickly.

Repeated excessive brake applications cause temperatures to increase to a dangerous degree, often resulting in complete breakdown of brake structures, failure of brake drum and wheel structures, and tire blow-outs.

Brakes were developed for your convenience and safety. They will continue to serve both purposes only so long as you treat them with respect. Develop a Be-Kind-To-Your-Brakes attitude.

Here's how:

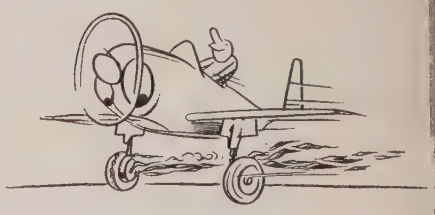
1. Insure sufficient time between touch-and-go landings to allow for a cooling between brake applications.

2. Take full advantage of length of runway during landing roll, so brakes can be used as little and as lightly as possible when stopping.

3. Parking brakes should not be set while brakes and wheels are in heated condition.

4. Do not drag brakes when taxiing, either intentionally or inadvertently. Be sure that toe pressure is not applied to brakes when operating rudder pedals.

Use Them But Don't Abuse Them



You Be The Judge—An old sunken well was considerably damaged during salvage of a crashed airplane. In answering the farmer's damage claim, the company's attorney tactfully intimated that the well was a bit decrepit to start with; therefore, the full cost of a new well could not be allowed.

The following bit of homespun logic is culled from the aggrieved farmer's reply:

"I don't see how you can truthfully say that about my well. It used to furnish excellent water. I imagine your plane was a *good* one before the crash, but it looked like an old wreck when they hauled it away."

Safety Quiz Answers (page 26)

1. Taxi back to the hangar line.
2. Definitely not. Use all altitude instruments, so that if one goes out you can fly "partial panel."
3. Upon first indication of swerve. Tendency is to wait too long.

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PLANE FAX

Quick picture of

ZIMMERLY AIR TRANSPORT

ASOTIN COUNTY AIRPORT, WASH.

Crop dusting, spraying; Charter Service; Student instruction; 24-hr. service; CAA approved repair station; 1 mi. from Lewiston-Clarkston.

How Northwest pilots extend overhauls to 1500 hours

"We've been able to extend our major overhaul periods to 1500 hours through the use of RPM Aviation Oils," writes Mrs. Bert Zimmerly, owner of 17-year-old Zimmerly Air Transport, Asotin County Airport, Washington. "And even then we find the engines exceptionally clean with rings free and a minimum amount of wear. We've also found that rust and corrosion aren't problems when you use this fine aviation oil. We've recommended and sold 'RPM' exclusively for ten years, and know that it has helped us cut maintenance costs."

Throughout the West, airport dealers tell the same story: "RPM" keeps engines running cleaner and freer with fewer overhauls.

TIP OF THE MONTH

"Know your plane thoroughly—or don't fly"

"The safety rule we stress today in flight training is the same rule that helped us train 1,725 Army and Navy pilots without accident: keep your plane in perfect shape *all the time*. Check it *yourself*. Always, our first lesson to each new student is the inspection and care of the plane—and that lesson never grows old."

MRS. BERT ZIMMERLY, OWNER, ASOTIN CO. AIRPORT

"We're looking forward to saving money!"

"All 20 planes at this field are now using CHEVRON 80/87 Gasoline and we're highly pleased," Mrs. Zimmerly writes. "It has ended take-off knocking and pre-ignition, and we're realizing considerable reduction in fuel costs." CHEVRON 80/87—the first light-plane gasoline with a controlled take-off rating—may be used in some makes of engines up to 600 horsepower.

CHEVRON AVIATION GASOLINE

RPM AVIATION OIL

Standard Oil Company of California

Pilot Report... Navion

(*Continued from page 38*)

control freedom and turned on the electric auxiliary fuel-boost pump. For the shortest possible take-off roll, we dropped slightly less than half flaps. To make sure that the flaps have stopped at the correct spot, apply full aileron and check to see that the trailing edge of the flap lines up with aileron. The new flaps have a mid-point notch that holds them at any pre-set position without creeping.

We lined up on the narrow runway, poured on full power (20 inches of manifold pressure at that altitude) and released the brakes. The ship picked up speed quite rapidly and bogged down just a bit as we sprayed through the first mud-hole. The control wheel was held quite far back to keep the nose wheel from dragging. There was absolutely no tendency for the *Navion* to swing to either side of the narrow, rutted runway and we climbed into the air after spattering mud and water over a good portion of the airplane. Our take-off took roughly a thousand feet of runway.

The fool-proof safety catch on the landing gear mechanism snapped easily and the gear popped up. We came back on the vernier prop control to 2900 and climbed out away from the lake.

"The engine change on this ship added just one mile per hour to the stalling speed of the airplane," explained Sloan. "When there is no one in the back seat, you must carry at least seven gallons of gas in the 20-gallon rear tank or 40 pounds in the baggage compartment to compensate for the heavier engine."

Normal fuel consumption, according to Sloan, is 13.3 gallons per hour at 75 per cent of power at 5,000 feet. At economy cruise, the rate drops to 9.7 gallons on 50 per cent power. With its 20-gallon rear tank coupled with the 40 gallons in the wings, the ship has a range from 640 to 900 miles, depending upon the power setting. Gravity flow from the auxiliary tank is calibrated at one gallon per minute so that a pilot may calculate quite accurately the amount of fuel remaining in the rear tank.

The air was calm as we came back over the San Bernardino Mountains and we rolled in and out of a series of turns. The ship coordinates beautifully and will make feet-on-the-floor turns without skidding the ball off-center. *Navion* calls their rudder-aileron coordinating cables (bungee springs) a "two control after take-off" system. It does just that and makes cross-country flights much easier.

"This ship is even good on instruments," said Sloan. "Want to put a map over the windshield and try it?"

It had been three years since we'd received our CAA instrument rating, and we'd flown only a couple of hours on "the gages" since that time. Naturally, the job was not precise, but we scotch-taped a map in front of the left windshield and went to work. Libra slid over into the left rear seat to watch for any traffic from that side while Sloan covered the front and right sides, and I concentrated on riding the gages.

We tuned the Burbank radio range and looked up the heading on a map. The ship handled just as easily on instruments as it did while flying contact even though the electric turn-and-bank indicator had a slight tendency to fluctuate. This disadvantage is overcome by the non-icing construction of the instrument. The ship has a regulation swinging compass, not the remote reading variety, that made it just a little rough to hold a precise compass heading.

We had no let-down chart for the Burbank Airport, but we drew one from memory on the back of an envelope (a deal I don't recommend as a general practice), and headed down into the smog. On instruments, the solid, big-airplane feel of the *Navion* is even more noticeable than in contact flight.

We came in over the Burbank range station from dit-dah to dah-dit, let down on a procedure turn and called the Lockheed tower for permission to make a simulated low approach.

"*Navion* 5130-King, you are cleared for a simulated instrument low approach. Report over the low cone."

When we reached the low cone, we had to change radio frequencies and wait for a break in communications to call the tower. When we re-tuned the range frequency, we had drifted off the heading to the airport so that we missed the runway even though we passed over the airport.

As we crossed the edge of the field, we pulled down the map from the windshield and took a moment to re-orient ourselves with the field. Then we swung into the traffic pattern for a landing. Believe me, it was good to see out again.

The gear and flap handles are shaped like a little wheel and a small flap section to make just one more safety feature. With gear and flaps down, the *Navion* settles smoothly and rapidly with power off. We turned in on Runway 15 and came over the wires with just a touch of power to keep the engine warm. On the landing flare-out, you can feel that extra hundred pounds forward of the firewall. It takes definitely more back pressure to hold the nose wheel off the ground than was required with the earlier models of the Ryan *Navion*. Actual landing, however, is almost identical and the extra one mile per hour in stalling speed is never noticed.

We taxied up to the line and climbed out of the beautiful two-tone "gala green" and ivory *Navion* that was now a little muddy under the wings. It looks almost like any other *Navion* except for the paint job and bright chrome stripe, but it flies like a brand new design.

At lunch we re-hashed the flight and talked about instrument flying as it pertained to the stable *Navion*.

"Did you ever make a GCA (ground controlled approach) let-down?" asked Sloan.

We shook our head.

"Let's see if we can line-up a practice GCA let-down," he continued. "I made one last week at Ontario in the *Navion* and came out right on the money."

We started phoning and found that the Los Angeles International unit was not yet in operation. March Field was loaded with traffic and Ontario was tied up with a CAA demonstration. Finally we received a go-ahead from the Los Alamitos Naval Air Station near Long Beach, and so headed in its direction.

The new *Navion* has an RCA radio with low frequency receiver and a VHF transmitter on 122.1 and 122.5 for CAA tower and range communication. The Navy GCA unit could not receive either of these VHF channels, so we arranged over the telephone with Aircraft Controller First Class J. R. Campau to fly over the field and tune in on

(*Continued on page 48*)

Cost of Comfort

(*Continued from page 13*)

The surplus B-25's we converted for the Continental Oil Company was one of 10 built by the Fisher Body Company. These 10 differed just enough from the North American model so that the interchange of parts was virtually impossible. We did a major rebuild job on the fuselage to make room for a comfortable interior. The shear panel between the front and rear spars that stabilizes the front spar was eliminated entirely. Diagonal stringers were added to transfer the shear loads in the "torque box" section and the front spar cap was stabilized by a shear web tied into the forward longerons. Then we put a 210-gallon fuel tank under the floor and another 130 gallons in the former tunnel into the nose section.

When we were through with this B-25, it was impossible to load the airplane in such a manner as to exceed the limits of the CG (center of gravity) even though all the heavy passengers were in the rear of the airplane.

The engineering alone on this conversion took 2500 hours. Paper work and CAA approval took another 150 hours.

One third of the airplanes we have converted for executive use in the past three years have been Douglas DC-3's. For military use, the C-47 version of the DC-3 has a heavy-duty floor that will withstand 200 pounds per square foot. Since no executive plane will need that high strength, we tear out the complete floor when we major the airframe. The up-slope of the floor at the aft of the cabin is removed and a six-footer may stand erect all the way back beyond the passenger door.

Our finished DC-3's weigh from 16,800 to 18,300 pounds empty. A fully "plushed" interior will weigh only 800 to 1400 pounds. When we first began this conversion work, we used half-inch plywood on cabin interiors that weighed nearly 450 pounds per installation. Today we use .030-inch wafer-thin material and save approximately 200 pounds. This 30-thousandth wood veneer is a laminated surface of very thin wood, then thin aluminum foil and finally macerated cloth. The whole covering is impregnated with phenol resin and bonded under heat and pressure. It is heat-resistant, fire-proof and costs the customer less money in the long run than a cloth interior because there is virtually no upkeep or repair work for the life of the airplane.

Our cabin bulkheads, for instance, are built of birch plywood over an "egg-crate" hollow-core construction to save weight.

Executive-conversion costs vary so greatly that any figure is merely an estimate. A basic surplus C-47 with low time will cost roughly between $22,000 and $25,000 at this writing. A complete zero-time rebuild on the airframe including new engines, removal and magniflux of all steel fittings, installation of a lightweight floor, complete radio equipment and an automatic combustion heater will cost about $40,000 and take approximately 5,000 man hours of work in our shops.

Only then do we start on the custom interior. For as little as $10,000 we can soundproof the cabin, install indirect lighting, cabin lining and a full set of comfortable seats. We spent as much as $65,000 on one company's DC-3, but they wanted all the trimmings, including gold-plated door knobs.

Extensive sound-proofing is a must for any executive plane. In flight, noise contributes more to passenger fatigue than anything else. At AiResearch, we normally use 20-thousandth gage mica sheets cemented directly to the inside of the cabin skin. This is covered with a two-inch layer of fiberglas between the frames and topped off with a one-inch blanket of fiberglas over the whole cabin interior. Then the wood or cloth custom interior is installed. When we're all through, the noise level is comparable to that of a high-class automobile.

Most executive conversions have a hot-plate galley for cooking eggs, steak or even complete meals. One of the oil company's DC-3 conversions had a women's "powder room" in the rear of the plane and a men's lavatory in the forward crew's compartment. Indirect lighting and "hot-wall" heating are installed and windows are a third again as large as on the original transport version.

We spend roughly $6600 in shop time and materials on the 14 large windows of a DC-3. The airframe must be re-skinned down the center of the fuselage and the frames must be "beefed up." Two full-length longerons are added to the fuselage. The windows themselves are built from two pieces of glass mounted with an evacuated air space between so that they will not frost over in cold, damp weather.

Complete carpeting with a base of one-inch foam rubber for sound-proofing and soft footing will cost from $300 to $800, depending on the type of carpet. Most of our curtains are hand woven—at a cost of from $4 to $18 per yard—and we use about 50 yards on each interior.

Most executive conversions have an enclosed sleeping compartment with a full-length foam-rubber divan bed. These divan beds are designed with special arm rests and linkage that provides instant reclining. We spent over $500 in engineering to save just two inches of floor space on these beds. We have been forced to develop our own aircraft furniture department to build lightweight, fully comfortable beds adaptable for aircraft use. The two 86-inch beds that we installed in the former bomb bay of the Chicago *Tribune's* B-17 cost nearly $1200, but they're just about the best beds ever built.

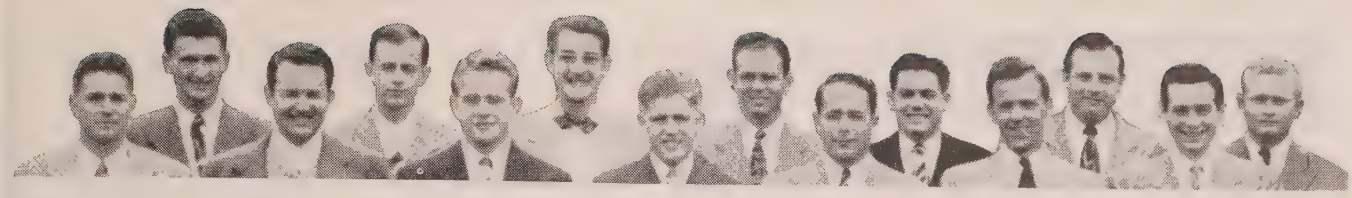
This B-17 has two chairs in the former bombardier's compartment for a front-porch view of the world.

Since many executive-type planes operate away from a home airport for days at a time, we nearly always include an "air-stair" door that requires no loading ramp. This unit has a hydraulic cylinder for smooth operation and is similar to the Southwest Airlines door that hinges from the bottom.

Many of our ships have their own collapsible tow bars for auxiliary field ground handling. These tow bars are designed to break at a slightly lower load factor than the shear pin to which they fasten. In that way, pulling the plane around in soft ground will never overload the structure of the landing gear. The tow bar on the B-17 folds and is stowed in the tail while the B-25 bar folds into one side of the bomb bay.

AiResearch originally began this custom executive-conversion work when we couldn't find anyone to re-build our own company

(*Continued on page 46*)



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- *Paul B:* "I am employed in Rocket Motor Design."
- *K. A. S.:* "I went to work the first Monday after graduation as an Experimental Technician in fuel cells."
- *Edward W.:* "I was hired immediately upon graduation. During the two years I have had several raises and a promotion. I am now working directly with the Project Engineer, in the new airplane Project Group."
- *Frank M.:* "Gene M. and I have been here at the Proving Ground for three weeks now. We have seen missiles and the V-2 rocket fired." (These two men were assigned to guided missile research as their first positions after graduation from Northrop.)
- *Douglas E.:* "I am in the Stress Group. My first job was to design the loading jigs for applying the torque loads in the (name of aircraft) static test."
- *Melvin H.:* "N.A.I. has an accurate idea of what is required of the new engineer. The practical end of our training has shown itself in a number of ways. Those of us with our technical school background have a definite edge in our work."
- *Allen B.:* "A wire offering immediate employment arrived a week after the interview. I am in Engineering Design."
- *Robert B.:* "I wanted to let you know how much I appreciate your help in securing this position. I work in the Missile Flight Test and Analysis Department."

*Names abbreviated here out of respect for personal privacy. Record on file in N.A.I. Graduate Placement Department.

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Cost of Comfort

(Continued from page 44)

DC-3 the way we wanted the job done. The main division of AiResearch builds some 90 per cent of all the cabin pressurization equipment of American-built airliners. At one time it appeared that we would have to service these units, and the only practical way was to send crews out by air. However, the airlines eventually set up their own maintenance organizations.

"Queenie," the AiResearch DC-3, has been guinea pig for most of the experimental design work that we have done. Right now we are in the process of attempting to license an engine conversion that will add 150 hp to each of the original 1200-hp engines of the DC-3. These slightly more powerful engines were originally built for the Navy's PB4Y-2—and there are plenty of them available in the original crates at a very reasonable price. They have forged cylinder heads instead of cast heads and consequently run cooler. The accessories are all lightweight, but the engine is a little longer than the original R-1830 so we had to use shorter starters to make the unit fit forward of the firewall.

We hope to license the DC-3 with these engines to carry an additional 1,000 pounds gross weight. The engines add only 60 pounds to the original airplane. When we have final CAA approval, we plan to build these units in a conversion kit so that they may be added to the customer's DC-3 when it comes in for an overhaul.

We have used "Queenie" (short for "Hangar Queen") frequently to show potential customers just how efficiently an executive transport will fill their specific needs. We take company executives over their own traveling routes and check the exact cost per passenger mile, gas and oil consumption and time saved.

When a customer wants speed and is willing to sacrifice a little room, we recommend a fast surplus bomber. Continental Oil's B-25 made the trip from Houston, Texas, to New York in four hours and 10 minutes. The seven-place interior was large enough to handle all the company's executive needs, and the airplane had the speed that was desired.

All drag items are removed from the exterior of every conversion. Even the DC-3 is speeded up by the removal of parapack racks, extra antennas, steam heat boilers from the right engine, the astrodome and the window gun ports.

If a customer wants long range, we can add fuel tanks to a DC-3. The plane we reconverted for Mexican baseball czar Jorge Pasqual, has an extra 300 gallons of fuel intended for over-water hops to Spain. This ship has the larger engines—Pratt & Whitney R-1830-75—so that he can operate from short, dirt runways at his ranch in Baja, California.

The *Tribune's* B-17 has sufficient fuel to make 3,000 miles non-stop. When we were through with this conversion, we had lowered the gross weight of the airplane by some 1500 pounds, increased her range 10 per cent and upped her cruising speed 25 mph by removal of blisters and turrets. Since we completed this ship, it has been around the world twice on news-hunting trips. The original idea for this conversion came from the *Tribune's* publisher, Colonel Robert McCormick, after a flight in one of General McArthur's converted B-17's in the South Pacific.

All modification work must be engineered and built to CAA specifications. Leo Smith, our shop foreman, is a designated CAA inspector. His job is to see that anything that comes out of the design section is properly built and installed. As Chief Engineer for the company, I'm licensed by the CAA to okay both structural and interior modifications as needed. With this type of CAA approval, we actually save time and money by building and licensing our own work, subject, of course, to CAA approval of the master drawings.

One of the sparkplugs of the whole executive aircraft trend is Eddie Bellande, our Manager and Chief Test Pilot. He's one of the real old timers in this flying business—23,000 hours in his log book. As chief test pilot for Lockheed, he checked out Wiley Post in the "Winnie Mae." He flew co-pilot for Lindbergh on the first TWA transcontinental run. He flew the first of the Lockheed *Vegas*. Most of his logged time was at the controls of the pioneer Maddox Airlines which later became TWA.

"The executive plane market has just been scratched," says Mr. Bellande. "Decentralization of industry will speed up the demand for airline standards in executive planes.

"The executive plane of the future will be a 9- to 14-place turbo-prop, pressurized, air-conditioned airplane. It will have a tricycle gear, electronic automatic pilot, television and rocket-assist for small field take-offs. Cruising speed will approach 400 mph.

"These ships, however, are still far in the future."

When we go before a corporation board of directors, the most common questions are: "How much will it cost and what are our competitors doing?" Since each company has a specific problem, we usually run a survey of their needs and give them a cost-per-mile estimate of their specific transportation problem.

We use this typical cost figure in our board of directors presentation. "Queenie" can transport 10 passengers from Los Angeles to Chicago for 3½ cents per passenger mile. Naturally, the more passengers, the lower cost per mile. On this same trip, the airline figures 7½ cents per mile and first class train tickets cost 7¼ cents.

We figure the cost of our airplane at an average of 50 flying hours per month. This includes the crew's salary, fuel, maintenance, overhaul, insurance and depreciation. Total operating cost is $65 per hour. The airplane will cover the 1,751 air miles between Los Angeles and Chicago in 9 hours or a little more, depending upon weather, for a total cost of $585. Ten passengers on an airline would cost $1303. On a train—which must travel 2,230 miles—the cost would be $1641. And with your own company airplane, there is no 15 per cent transportation tax.

The pay-off for an executive airplane, however, is in convenience and comfort. The airplane is waiting when you want to go and it will take you to the exact destination you may wish.

The intangibles of company prestige and the enlarged scope of operation are almost impossible to figure.

This is only the beginning of the executive-type transport.

Check and Double-Check

(*Continued from page 17*)

A hairline crack in a weld, a faulty fuel gage, a loose nut or a bent bell crank are potentially more dangerous than a broken strut or a badly worn tire simply because they are easy to overlook during pre-flight inspection.

This fact was brought forcibly to Jim Warren's attention. Jim, a heavy machinery salesman with several western states included in his territory, has been using a lightplane to contact prospects for the past several years. But being an amateur pilot at heart, Jim insists on inspecting and doing minor repair work on his own airplane.

If you had told Jim six months ago that his inspection technique wasn't up to par, you'd have ruffled his ire. He'd have produced completely checked off inspection sheets by the score and pointed out that he'd had more than 2,000 trouble-free hours in the air.

The let-down came one day recently when Jim had to make a rush call on a prospect in a central California town. He hurried through the usual pre-flight inspection, checking the inspection sheet as he worked. Everything seemed shipshape. He took off from the airport, circled into the pattern, and headed toward his destination.

As is usual on a fine day and with everything ticking perfectly, Jim gave himself over to the pleasure of flying. He crossed the San Gabriel mountains, encountering only a few mild thermals, and was well out over the Mojave Desert when his eyes chanced upon the fuel gage. He looked away, then came back for a double take. The fuel gage still said "FULL."

For the next 60 seconds, Flyer Jim Warren performed some rapid mental calisthenics. In the hundred miles he had covered, he should have used about five gallons of fuel. That would leave the tank three-quarters full. He had another 200 miles to go, and should have plenty of fuel. But did he? When had he refueled last? Was the tank actually full when he started, or had the gage read "FULL" with the tank half empty? Beat his brain as he could, he couldn't remember.

He pounded the gage dial, performed a few quick maneuvers in an effort to shake the sticking gage-float loose. No soap. The instrument still lied, "FULL."

Luckily, this story has a happy ending . . . a happy ending in two ways. Jim reached his destination with a little gasoline to spare, and a lot of cold sweat soaking his spine. He also reached his destination with a sound determination to never again take anything for granted about an airplane.

"In a way, I'm glad it happened," he said later. "It made a better inspector of me. Now I 'stick' my fuel tank as well as check the gage. I also do a lot of double-checking during inspection that I never did before. I try to use a little common sense along with my eyes and the check-off list!"

A lot of pilots look upon pre-flight inspection as an unsavory chore that must be accomplished prior to taking off. Regarding it thus, they hurry through it as rapidly as possible. It is far safer to regard pre-flight as a composite part of piloting the airplane, and accomplish each inspection with the same automatic precision used in manipulating the controls during flight.

One of the first lessons the careful inspector must learn is that the inspection check-off list is only a guide. It leads logically from one part of the airplane to the next, making certain that no major part is missed en route. But the list cannot do more than this. It can not control the kind of inspection actually given the airplane. A list naming each part to be inspected and telling how to inspect it would be as long as a text book. In some respects, the inspection check-off list may be compared to a travel guide, *i.e.* it will tell you where to go and how to get there, but it can't control what you see or do along the way.

In developing an inspection technique, each pilot should lay out a definite schedule to fit the requirements of his particular airplane, a schedule that will lead him logically from one part of the plane to another. Most pilots prefer to start at the nose, then work progressively around the airplane, inspecting all points at each station before proceeding to the next. By following this definite pattern until it becomes habit, the danger of missing vital points during a hurried inspection is greatly minimized, and the whole inspection procedure is stepped-up by the elimination of guess-work and doubt. In fact, the inspection procedure soon is similar to your following a well-known footpath.

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Pilot Report... Navion

(Continued from page 42)

the Los Alamitos tower on 379KC. When we could read the tower on the cabin speaker, we were to rock our wings and follow the ground controller's instructions without being able to talk back to him.

There were no gyro instruments in the *Navion*. All we had to work with was an electric bank-and-turn indicator, a compass, a sensitive altimeter and an airspeed indicator. No simulated instrument let-down was ever made with fewer instruments or less previous straining.

We circled the Navy field at Long Beach, picked up the GCA unit on the prescribed frequency and rocked our wings in acknowledgement. Then we taped the map over the left side of the windshield, turned up the cabin speaker so that we could hear all the GCA instructions and settled down to "drive the gages."

"*Navion* three-zero-king, we have you in sight on the scope. Take up a heading of 110° and descend to 1200 feet.

"Turn to zero-four-zero degrees and maintain 1200 feet. You are now on your downwind leg. You are six miles away from the field. Drop your landing gear and make all pre-landing cockpit checks.

"Now turn left to a heading of 315°. This is your base leg. Hold 1200 feet and maintain a constant airspeed.

"Make all turns a standard one needle-width and make your corrections quickly. Turn to 220°."

A new voice cut in on the cabin speaker.

"This is your final-approach controller. If you do not hear my voice for a pause of over five seconds, pull up and head for the Long Beach radio range station. You are now six miles off the end of the airport. . . . . You are on the glide path. Begin a descent of 500 fpm. . . . . Turn left two degrees to a heading 218. . . . . You are 10 feet above the glide path. . . . . Turn left two degrees. Your new heading is 216. . . . . You are on the glide path. . . . . Turn right two degrees to 218. . . . . You are 10 feet below the glide path. . . . . Twenty feet below the glide path. . . . . Thirty feet below the glide path."

We eased on a little more power and flicked a glance at the engine instruments.

"You are now three miles off the end of the field and you are 10 feet below the glide path. . . Make all corrections promptly. . . . . Turn left four degrees to 214. . . . You are on the glide path. . . Turn left two degrees to 212. . . . You are 10 feet above the glide path."

We took a quick peek at the altimeter as Doc Sloan unwound his long legs and flexed the muscles in his arm as though he wanted to reach for the wheel. The altimeter was indicating 200 feet and suddenly the cockpit seemed hot and stuffy.

"You are to the right of the runway center line. . . . Turn left two degrees. . . . Your heading is 210. . . . You are 10 feet above the glide path."

The controller's voice was calm and reassuring, but the *Navion's* instruments told us we were down to 100 feet.

"You are approaching the runway. . . Turn left two degrees to 208. . . You are on the glide path. . . . You are now over the boundary of the field and the center of the runway is 80 feet to your left. Come out from under the hood."

We clawed away the map and glanced quickly to our left. There was the runway. To our right was a row of parked Navy planes and we were just at the altitude where a *Navion* should be flared out for a landing.

The whole let-down had taken only 10 minutes. From the back seat, Libra commented that the GCA handling at Los Alamitos was similar to that on the Berlin Airlift.

We did not land at Los Alamitos because the Navy Commander on the phone had advised us there was considerable red tape involved in getting in a civilian plane off a Navy Field.

The GCA experience, however, was a revelation. With a good, solid-flying airplane, an absolute minimum of instruments and a little faith in the man behind the radar scope, any pilot who can keep his airplane right side up on instruments can make the airport on GCA. We could have made a safe landing on this first-try simulated approach if the ceiling had been 100 feet and visibility 1/16th of a mile.

In spite of the superb job of simulated low-visibility landing shown by both the *Navion* and GCA, it should be stressed that flying dirty weather and instrument conditions in any single-engined airplane is asking for trouble. Don't do it deliberately. Be wise . . . and live to be an old pilot.

No other type of flying shows off the inherent stability and solid handling of the *Navion* so much as simulated instruments. It is easy to understand why Ryan has the following statement on the bottom of all business stationery: "The average Ryan *Navion* purchaser is a 44-year-old businessman."

For something new, different and delightful in the realm of private flying, make a hop in the new *Super Navion* "260." It is a fine, conservative airplane made even better by added power.

Tom Thumbs

(*Continued from page 23*)

takes the expert civilian craftsmen who make these models from six weeks to nine months to construct a miracle midget.

The unit, located at Wright Patterson Air Force Base, Dayton, Ohio, has made and flight-tested miniature gliders, jets, 'copters, and a B-17, just to name a few.

Built into the framework of each model ship is an elaborate system of test recording devices, cameras, and a safety parachute.

The unit's chief, Adam J. Stolzenberger, a pioneer in model aircraft research, sparked the idea of detailed replicas in place of full-sized ships for dangerous tests. This happened during the war when he was a pilot-engineer stationed at Wright Field. Now as a civilian, Stolzenberger heads the unit which has grown from a single desk in 1945 to one of the biggest and best-equipped laboratories of its kind in the country.

Civil Service technicians of the Dynamic Model Unit turn out two general type ships: radio-controlled free-flight scale designs, and control-line planes. Radio-controlled models are used to study new designs, exploring their aerodynamic characteristics about three axes. Control-line prototype provide data on movements about a single axis. Although limited to one axis, control-line models fly more like actual planes than do the radio-controlled type.

The self-powered control-line models are flown from an especially constructed Tom Thumb airport on a hilltop close by Wright Patterson's super-bomber runways. This special field consists of a circular clearing about a quarter of a mile in diameter. It is equipped with a central pylon or control-line base tower from which strong but thin flight-control wires lead to the small ships.

A pilot sits in a full-size cockpit mock-up from which position he manipulates the flying model as he would a full-scale ship.

Wind-tunnel testing's big failing is that the model under test remains stationary, therefore tests do not show the true aerodynamic movements of actual flight. Within the next year the Dynamic Model will have set up a project combining both man-made wind and their free-flight midget planes.

An air duct 40 feet by 15 feet in cross section will force a vertical column of air across a flying model's path. The unit's test engineers will check the ship as she enters the violent up-draft. Although gust research has been going on for years in an NACA gust wind tunnel at Langley Air Force Base, this is the first time that the plane designs tested will be free-flight power-driven replicas.

The unit's technicians also have developed two general purpose jets which hit speeds of 200 mph. This is just about the fastest that airplane models have ever flown. These miniature firecans are powered by engines similar to those in the V-1 buzz bomb.

In its well-equipped shop of jig saws, planners, lathes, and intricate machines, Stolzenberger and his men have learned revolutionary methods of model-plane construction. Craftsman are now building models on a mass-production basis. Inexpensive plastic copies are being turned out from a single handmade master. These plastic ships will be used as guinea pigs in high-speed tests against the sonic barrier and beyond. If their design does not allow them through the barrier, the loss will be cheaper than with the expensive hand-fashioned models.

Beside making midget planes the unit runs tests on the ship's tiny engines which are designed and built by commercial manufacturers. The Dynamic Model Unit operates like a full-scale aircraft factory. Specifications and bids are drawn up by Wright Field Model technicians. The lowest bidder and best product gets the contract.

Once the unit requested a gasoline engine to fit inside a miniature bomber nacelle. The engine had to produce 2½ horsepower, 7,000 rpm, and weigh no more than four pounds. All this had to fit inside an eight-inch opening. A company successfully made the engine.

Dynamic Model Unit's pride and joy is a copy of the bat-like YB-49, *Flying Wing*. Craftsmen worked four months on the baby '49, and the ship is equipped with a full set of flight instruments. During a test flight these instruments workings are recorded on 16-mm film. The model has five radio-control channels. A 28-foot chute opens when the ship starts in toward its field. At the same time the chute unfurls a landing gear automatically drops down.

The Dynamic Model Unit keeps busy drawing up new designs at its hanger-like headquarters, building little things that pay off in big things.

No wonder test pilots affectionately pat these midget masterpieces. The little ships are helping to save their lives.

Check and Double-check

(*Continued from page 47*)

Double-checking during inspection is largely a matter of alerting every sense to the job. Though the eyes are vitally useful, they are not a serve-all. A lot of faults cannot be seen by casual observation. Check parts by moving them or trying them for tightness. When a part is moved, listen for any unnatural scraping or knocking noises. In one instance, a dangerously frayed control cable was discovered because it made a slight scraping noise on the fuselage fabric when the rudder was moved by hand. Another pilot heard a strange crackling sound when he ran his hand along the fabric wing cover. He investigated and found an inner wing-light wire with faulty insulation. When the fabric was depressed, the wire was grounded with resultant sparking. Undiscovered, it could have caused a bad fire.

Assuming that an airplane is about to be inspected, let us examine trouble possibilities at the various stations. We cannot include all possibilities, but only enough to indicate the value of double-checking during each preflight inspection. After making certain that the ignition switch is "OFF," we approach the propeller. The check-off list tells us to examine propeller hub bolts for tightness, and the blades for alignment, checks and cracks. The hub bolts may be secure and tight, but are they cottered? There may be no cracks or checks in the prop blades, but if it is a wooden propeller, is the tipping secure? Is there any evidence of lamination separation? Let's turn the propeller through several revolutions and listen for strange noises. A hissing noise, other than normal compression leak coming from the engine, may indicate sticking or leaking valves.

The next logical inspection is the nose case of the engine, including the thrust-bearing cover plate. Are all bolts tight and cottered? Are any parts missing, any broken baffles, brackets, any signs of excess oil leakage from the crankcase? Are all spark plug wires attached, and what is the condition of the wire insulation? You'll have to use your hands to determine the soundness of both terminal attachment and the condition of the insulation.

Are all accessory cowlings firmly attached? Test them using touch pressure. Try to move them. Does anything rattle when you shake it, that is, anything that is supposed to be tight? And now is a good time to check the engine oil for quantity and condition. How does the oil clinging to the end of the measuring device feel when rubbed between the finger tips? Any roughness or grit? Maybe an engine bearing collar has broken loose and small bits of babbitt are circulating through the oil system. Let's take a glance at the carburetor, gascolator and all fuel-line attachments. Are there any signs of leaks? Leaking gasoline lines and connections are a distinct fire hazard.

Next station will be the landing-gear assembly. Are all bolts and nuts secure and properly cottered? Do the shock struts seem okay, or is there an excessive leakage causing dense, dust-soaked oil stains? Let's make sure the brakes are free of mud, grass or other foreign material that might affect operation. And the tires . . . ? How about that small, apparently superficial cut? It may be deeper and more serious than it appears. Pry it open and test its depth with a small probe. We'll move each wheel far enough to examine the portion of tire in contact with the ground. No cuts . . . but what was that clicking noise when the wheel was turned? There it is! A slightly loose hub bolt, just loose enough to cause a click when the wheel is turned, and providing sufficient play to produce severe wear and eventual bolt failure. Yet the check-off lists us merely to *examine* all bolts for tightness. That bolt felt tight until the wheel was turned.

If all this gets monotonous the first trip around, remember it will get easier after we train ourselves to double-check everything as we go. Let's take a look at the wing structure next. First we'll note its appearance. Is there any distortion that might indicate a broken or bent rib? A warped or split spar? Has gravel kicked up by propeller wash during take-off been eating at the leading under edge, abrading away the dope, punching tiny holes in the fabric?

We pause at the wing tip long enough to sight along it and double-check for trueness of contour. Let's grasp the wing tip and shake it vigorously, both forward and aft and up and down. Maybe something is loose inside and will rattle. Or maybe we'll hear the ominous click of wing-root mounting bolts that are loose. Now let's switch on the running and landing lights and shake the wing again. Do the lights blink? If so, we'll have to check all wiring in that wing for worn insulation that is causing the short.

Now we try the ailerons. Do they move freely, or do they seem to bind at some point during the arc of their travel. Does movement of the control cables cause any unfamiliar sound? Are the aileron mounting bolts secure and cottered? The aileron horn bolts? Are the limit stops solid, and does the aileron come firmly against them? Inspect the same features on the landing flap.

We now pass toward the rear control surfaces, inspecting the fuselage enroute. We watch again for visible distortion that would indicate broken or bent longerons or ribs. Are there any stains that might indicate leakage from interior fluid lines? Any holes in the fabric, or areas where the dope coating has been destroyed? Never permit even the smallest hole in the fabric fuselage cover to go unpatched for long.

When we reach the rear of the airplane, let's glance first over the tip of the stabilizer toward the front of the plane. This simple sighting operation, with the airplane evenly divided on either side of the stabilizer tip, will often indicate even very slight distortion or misalignment. Now grasp the stabilizer tip and shake it vigorously. Listen for rattles, and note the firmness of the stabilizer mounting. Check anchorage of the radio antenna. The elevators and rudder are checked using the same measures employed with ailerons.

The trip back the opposite side of the airplane will be a repetition in reverse order of what has gone before. Finish with cockpit or cabin inspection. "Stick" your gasoline tank and compare the amount of fuel it contains with the reading on your fuel gage. If the plane is equipped with radio, check it.

The foregoing sounds like a lot of work, and it is at first. But even the most difficult of tasks become simplified by rigid routine. And once this routine is established, careful inspection with double-checks wherever they will apply comes just as easy as a half-hearted once over.

Destroyers Up!

(*Continued from page 19*)

decided when he toured Europe with the Joint Chiefs of Staff that only the fastest, hardest-hitting and most modern aircraft the United States could supply were good enough for America's first line of defense.

He further decided that replacement should be on a one-for-one basis, which means not only that the number of *Thunderjets* now in the command equals the number of F-47's and F-80's here before, but also that at no time during the exchange did the number of available fighter planes drop below that number. In other words, no planes left the 2nd Air Division for home before their replacements had whispered into the Bavarian bases.

And this F-84E is quite a baby. She's young, but already she holds the American distance record, picked up in the Bendix Race last year. A major named Vernon A. Ford whipped a *Thunderjet* from Edwards Air Force Base, Calif., to Cleveland—2,010 miles—in three hours, four minutes and 51 seconds, and that included a landing at Smoky Hill AFB, Salina, Kansas, to refuel. That works out to an average speed of 529.6 mph, which is somewhat faster than walking.

It took a while to work the kinks out of the *Thunderjet*, and the big problem of fuel and distance versus weight and speed is still making the engineers at Farmingdale, Long Island, dig their noggins. But they lifted the ceiling for the Easy model 5,000 feet over the Dog version, opened the throttle a few crucial miles wider, and stretched the radius 150 miles.

And an item to remember is that this giant stride was taken without lessening the wallop of the 32 high-velocity aircraft rockets the *Thunderjet* can tote, along with her six .50-cal. machine guns.

Of course, that's only one combination of armament, albeit perhaps the most spectacular, for it gives an airplane roughly the same killing power as the broadside of a modern destroyer—and at almost the speed of sound.

But the *Thunderjet* also can be rigged to deliver 2,000 pounds of bombs if the mission at hand calls for that kind of mail, or two 100- or 500-pound clusters of fragmentation bombs, aircraft depth charges for work against enemy submarines, incendiary bombs or NAPALM tanks, right handy when a ground flame-thrower can't quite reach the target.

One of the things fighter pilots like about the plane is that when the rockets or bombs are gone, the holders may be retracted or jettisoned. That means increased speed, and speed is safety when "that stuff" is in the air.

The Easy model of the *Thunderjet* is appreciated by ground crewmen, too. The craft is easier to service because of 180 access doors, and that means cutting down time between missions. Along that line, there is a retractable battery lift, hinged gun deck, guide rails for the engine, snap-on electrical leads and throttle disconnects for rapid engine interchangeability.

All this may be translated into better ground-crew efficiency, highly important in military aircraft. For example, the hinged gun-deck cover makes it possible for one

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Flight Exam.

(Continued from page 21)

pilot applicant. To help you get over that psychological hump, therefore, let's have a dry-run flight-test!

Preliminaries will include a check of the candidate's documents: 1) The Pilot Flight-Test Report (Form ACA-342A) is reviewed for all necessary items. Special attention is given to the entry of flying-time totals.

2) The Student Pilot Certificate must be current and signed. Student pilot certificates expire after 24 calendar months and are not renewable. If yours is out-dated, you'll have to get a new one.

3) Student's Medical Certificate may be 1st, 2nd, or 3rd class, or he may present a military flight surgeon's certificate. It must indicate a successful physical exam.

4) Your Log book is checked to substantiate the flight time entered on your application. Dual cross-country flight must be endorsed. Solo-flight credit is given only for time in which you have been the *sole* occupant of the ship.

For the next hour and a half the Examiner or Agent will give the student his undivided and unhurried attention. And all for good reason: he is trying to put the student completely at ease and to let him know that he will be given every consideration.

Before the test moves out to the flight-line, check your wind and weather for the field and the area in which you'll be doing your flying. Check your 'chute for current certification and tote it properly.

The first part of your flight test will be the pre-flight check. The pre-flight check is not only a wise precaution but it helps the examiner in analyzing a student's background and his knowledge of the airplane. Inspection of your ship is not merely visual. To do the job properly and thoroughly, it takes "touch and talk." General procedure is to start with the propeller, and work your way around the airplane, left to right. Check the prop for security, nicks, etc. Then check the windshield. If it's badly cracked, scratched, or crazed, stop right there and ask for another ship. Check gas and oil, visually, *i.e.* look in the tank instead of relying on a gas gage. Then check the cowling and pins for tight fit to eliminate vibration. Landing gear and bolts, struts and strut bolts, and any visible control wires, should be checked for secure attachment. Fabric condition needs checking for holes or patches. The tail-section gets attention too, for proper and secure attachments, fittings, an external bracing. Rudder action and proper tab setting should be noted, as well as the tail-wheel unit for operation and position. These are the highlights in the inspection, with emphasis placed on safety and practical operation, and not on the technical aspects. You should also know the capacity of the plane's fuel and oil tanks, the grade of fuel and oil recommended by the engine manufacturer, and the approximate fuel consumption per hour.

While you, the student, are doing the pre-flight, the examiner will be doing a "mental" pre-flight of you, so be thorough.

Before getting in the ship, it's a good idea to check the interior. See that the control stick is firmly locked in place. Wiggle it and watch your aileron and elevator action. Check your switches for "OFF" position, and if you need a cushion, be sure it's there.

After the engine is started, and during warm-up, your examiner may have you call out your instrument check on oil temperature, altimeter setting, tachometer, carburetor heat position, etc. If the plane you're using has a radio, check that. Your consciousness of airworthiness is determined by these last-minute details, so make them count. Check your controls again.

With all that done, you are now ready to taxi out and really do the job. Good ground handling will be expected of you. The Examiner is looking for safe speed, lots of "clearing" (keep the head swiveling), and use of good judgment for the ship you're using. Don't "S" turn all over the lot if you don't need to. Smooth use of throttle and brakes, and correct use of controls with reference to wind direction—up, down, and cross—are also rated. Keep an eye out for light signals if your airport uses them. Clear all around again and start your take-off.

The examiner at this point, will have formed some opinions regarding your judgment (observation of traffic and clearance), and your decisiveness (taxiing). On the take-off, he can tell a great deal more about your state of mind by the manner in which you use your controls. If your use of stick and rudder, throttle feeding, and pull-off are over-controlled, forced or jerky, he will realize you are nervous and unsure. Smooth, decisive, firm, "no-waste-motion" performance tells him you are confident. *Take your time.* See that you're aligned with the runway—it's easier to maintain a heading that way. After you're off, the only immediate problems are proper power setting, normal climb attitude, and the checking of local traffic.

The Examiner's judgment of your performance in climbs and climbing turns will be based on: 1) *uniformity*: the degree of bank, rate of turn, and the position or height-angle of the plane's nose above the horizon (should be the same for both right and left climbing turns); and 2) *use of maximum efficiency* at climb power setting in straight ahead climbs and climbing turns.

If you can get in that groove right from the start and stay in it, 720° Steep Turns are a cinch. The secret there is the proper "building up," or "feeding" slowly into the bank in excess of 45°, coordinating this with necessary power increase—then hold her there. The Examiner is looking for the proper power, the ability to hold a constant degree of bank and a constant altitude and, of course, the correct heading when you've completed the maneuver. Though it's not required, you'll receive consideration in grading for being able to roll directly from one bank to the other. Your leeway on altitude variation is 200 feet. That's a lot of feet, if you don't let it get away from you!

In slow flight (maneuvering at minimum speed), the Examiner will look for your ability to recognize and hold a minimum controllable airspeed. He'll ask for straight flight, turns to headings in level flight or during climbs and descents. Though no exact speed can be specified, it should be 10 to 20 per cent above stalling speed. The Examiner will look for your ability to maintain altitude and heading, and to avoid unintentional stalls. He'll probably ask you to close the throttle and allow the airplane to stall. If your slow-flight airspeed has been correct, indications of a stall should occur immediately.

Although no fixed sequence of stalls is required, the Examiner will be thorough and particular on these. Emphasis is placed on standard stall recovery, which procedure is to break the stall by smoothly lowering the nose below the horizon, stopping any yaw and maintaining a heading with rudder, applying all available power, and recovering smoothly to laterally level flight with coordinated use of rudder and aileron. Now that the spin recovery is no longer a phase of the flight test, your proper use of rudder in recovery and maintaining your heading, will be checked closely as a spin-prevention measure. Also, your recovery from partial stalls with a minimum loss of altitude will be considered a simulated emergency maneuver. The Examiner must be sure that you can recognize the physical symptoms of a stall, so he may ask for several recoveries—with and without power, from straight flight and turns, coordinated, or slipping or skidding. He will determine your ability to take prompt and proper corrective action right here.

To the Examiner, Pylon 8's, more than any other one maneuver, tell him the most about you as pilot-potential. He will look for your general awareness of your aircraft's position with relation to ground, pylons, and possible traffic. He'll note whether you can fly with your attention diverted at all times to objects outside. That's important, you know. He will judge your "plan-ability" by your selection of pylons, your consciousness of wind direction and velocity, and your anticipation of good forced-landing fields. The usual requirement here is a series of three moderate-bank around-pylon 8's, with and altitude variation of not over 200 feet.

Whether your accuracy landing phase of the test comes at the beginning or end of your flight-test, it's a source of anxiety to most students. Stop worrying! You'll be asked to make a series of three landings power off, with a 180° approach from field-pattern altitude but not over 1,000 feet. You must land beyond and within 300 feet of a designated line. One of these landings must be done with the use of a forward slip. Examiners tell us what they like to see here is good common sense. Plan your approach, and keep your ship at its best-performing airspeed for the normal glide. Keep a constant lookout, and this means head and eyes alert for other traffic. By the time you've turned off your downwind leg, you should have that "built-in" drift correction for your base leg. If you haven't, correct for it then and there. The Examiners are particular about a safe altitude for that final turn, so you'll have to watch it. Your performance will be judged, too, on the basis of coordination and ability to hit the spot.

Most Examiners prefer to tell the student immediately the result of the flight test and why. If you have failed, he wants to explain why, and go over the weaknesses that were apparent to him as well as the points that were good about it. You will be re-tested merely on the points and maneuvers in which you have failed. And, if you have passed, he will tell you your weak points and generally encourage you on the good ones.

What the CAA wants and what you want is the same thing—a full-time combination of safe pilot and safe airplane. Remember—he doesn't want to fly you *twice* if *once* will do it—so—sit easy!

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(*Continued on page 56*)

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(*Continued from page 55*)

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MISCELLANEOUS

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Destroyers Up!

(*Continued from page* 51)

man to gain access to the gun deck in nearly all types of weather. And such a relatively minor thing as a shift in position of the pitot tube—from fin to nose duct divider—makes it handier for covering, thus saving both time and grating on the crew chief's nerves, because now it is not necessary to disconnect the pitot for engine changes.

There's a new engine in the F-84E, too, with a 25 per cent increase in power. This Allison J-35-A-17 engine, made by the Allison Division of General Motors, raises the dry thrust from 4,000 to 5,000 pounds over the F-84D. The net result is increased range from 600 miles to 850, service ceiling to "above 45,000 feet" rather than 40,000, and speed in excess of 600 mph, slightly faster than the Dog model. One of the most recent improvements in the F-84E is the addition of two 230-gallon fuel tanks mounted on bomb shackles under the F-84E's inboard wing section. This extra fuel further increases the F-84E's range from 850 miles to more than 1,000 miles. These tanks are droppable.

The new engine has a winterized fuel system, and changes to permit gasoline operation instead of exclusively kerosene.

The Easy version has some other improvements, too, based on field experience. For example, the metal skin on the wings and ailerons has been reinforced; the landing gear is retracted mechanically in the new model. The old model has an hydraulic shrinkage system. This new gear-retraction system eliminates all hydraulic sequencing operations and provides safer and more serviceable cold-weather operation, likely to be an important factor in a future war. The new model will also take a greater "G" load, through additional structure in wing and empennage sections.

And for the first time, aerodynamic fins on wing-tip tanks permit the new *Thunderjet* to whip through maneuvers without jettisoning the tanks. This is a major improvement over all previous jet fighters, which had to cut down their range by releasing their auxiliary fuel tanks before they could be put through combat paces.

The man in the cockpit hasn't been forgotten in the new model either. There's an extra 15 inches of fuselage in the Easy model to allow for long-legged flyboys, and a re-arrangement of the cabin air-pressurization system to provide better distribution of air for the pilot. The new system was designed for pilot comfort at any and all altitudes, regardless of whether the temperature outside the cabin is 50 below zero or 100 above. The new design provides for maximum pilot efficiency under almost any condition.

Standard radio-control panels make it less difficult for a pilot to go through the transition from older aircraft to the newest *Thunderjet*, and latest armaments are his insurance in case there's a need for gun talk. Improved exterior lighting makes tactical operations safer and easier off wartime-like strips laid hastily on the handiest level spot.

This, then, is the airplane which bolsters the West's position in Europe. This "flying destroyer" which rules the skies over the American Zone is indeed an ace for Uncle Sam in Europe. An ace—and a club.

Radar Installations Scheduled at 71 U. S. Airports. Completion Expected in 1953 . . . page 62

NAVICOM

NAVIGATION, COMMUNICATION

Private and Executive Pilots Switch To Omni, with Equipment, Ranges Now Available . . . page 63

Edited by Col. N. F. Silsbee

Why Navicom?

The flying public is just beginning to realize that our country is giving our airways a new look which corresponds roughly to what took place in the 1920's with the extended development of paved highways, balloon tires and four-wheel brakes.

The need for electronic facilities in aviation goes back to the earliest days of organized air traffic. Radio was indispensable when the air mail began in 1918. Beginnings were made in the use of radio direction finders by which the pilot could steer toward his objective when visibility was low.

From these beginnings the low frequency four-course radio beacon and marker systems were developed after the mid-twenties, and the term "flying the beam" entered our national vocabulary.

Heavy increase of air traffic of all types—military, scheduled airline, nonscheduled operations, training, lightplane flying and the beginnings of executive aircraft operation—made the old airways system of navigational aids inadequate.

To meet the needs of all types of flying a genuinely integrated national system had to be developed. As a result of studies by all agencies concerned, a "common system" civil and military—was agreed on, based on the detailed studies of the Radio Technical Commission for Aeronautics' Special Committee 31. (See opposite page for an outline of the SC31 requirements.)

The first step is the "transition program," which can be brought into general use by 1953. It has been under way for about two years, and the time has come when the flying public needs very clear and detailed guidance as to its operation. Hence NAVICOM.

In this section it is proposed to give, month after month, the latest information as to the progress of the various ground installations, the operational use of airborne equipment, pilot procedures, notes on new equipment and literature, etc. If you have any questions you want answered send them in and we will do our best to provide accurate and authoritative answers. This is your section —use it!

The backbone of the new airways is R-θ Navigation. (R is for range and θ, the Greek letter *theta,* the mathematical symbol for azimuth angle.) Give a navigator his *bearing* and *distance* from a fixed point and you have provided him with a definite "fix" in polar coordinates. The combination of VOR (Very high frequency Omni-directional Radio) ranges and DME (Distance Measuring Equipment) does just that. Detailed information on both of these developments are found in our opening NAVICOM section.—NFS.

RTCA Gathers in Nation's Capital for Meeting

Progress report on operational use of Transition Program is given RTCA members, observers from government & industry

By Col. N. F. Silsbee, USAFR

Under the title "Electronics and Aviation Safety," the Spring 1950 Meeting of the RTCA Assembly was held on March 30 and 31 at the Hotel 2400, Washington, D. C. The purpose of the meeting was to provide a progress report on the present status and the operational use of the Transition Program—first phase of the Common System of Air Navigation.

Over 300 were in attendance, including members of the Radio Technical Commission for Aeronautics, representatives of the Armed Forces, CAA, CAB, Air Coordinating Committee, FCC, ATA, ALPA, CAOA, and the aviation and electronics industries. The meeting was called jointly by L. M. Sherer, Executive Secretary of the RTCA, and Charles F. Horne, Acting Director of the Office of Federal Airways, who holds the major responsibility for the implementation of the program on the civil side, as has Maj. Gen. Harold M. McClelland, Department of Defense, for the military.

▶ **Common System**—Mr. Horne discussed the Common System in some detail. He said the system would render benefits to all in common—military pilots, airline companies, non-scheduled operators, and the owners of small personal aircraft.

The need for a common system was apparent soon after the end of the war. In 1947 the RTCA established Special Committee SC-31 to study and resolve, if possible, the problems of air space and traffic control involved in setting up such a system. This task was so difficult and so complex that many people despaired of its success. The interests of small-plane owners, for example, scarcely resemble those of the Military Air Transport Service. The needs and problems confronting a fighter pilot differ in many ways from those of a scheduled-airline pilot.

Yet from this welter of fundamental conflict, SC-31 molded a set of plans for a common system which was accepted by every significant segment of aviation, civil and military. Their report published in May 1948, "Air Traffic Control" but popularly known as the "SC-31 Report" is the bible of the Common System.

▶ **Basic Principles**—The report listed 19 basic air traffic control principles required by the Common System. These explain, in broad terms, what we expect the Common System to accomplish from a technical standpoint. They provide a scale, too, against which the devices and accomplishments of the Common System can be measured. Here are the 19 principles: 1) Safety; 2) Expeditiousness; 3) Reliability; 4) All Aircraft Use; 5) All Weather; 6) All Air space; 7) Minimum Control; 8) Integration; 9) Human Factors; 10) Evolution; 11) Flexibility; 12) Security; 13) Limitation of Traffic Flow; 14) Language Difficulties; 15) Identification; 16) Division of Responsibility; 17) Division of Equipment; 18) Frequency; 19) Cost.

Charles F. Horne, CAA *(left)*, and Fielding Robinson, Vice President of Hazeltine Electronics Corp., sign contract for DME beacons to give pilots distance info

Overheard at RTCA

"Omni should come into its own in 1950, with 1951-2 the big years for DME. Boy, then we'll really have something!"

RCA engineer: *"There's no doubt about it. Jim Riddle and his boys have certainly turned out one swell little unit in the Narco omni."*

Bendix sales engineer: *"Practically everything I said about PAR was on the Gilfillan stuff. I couldn't say a darned thing about the new job we are doing for the Navy!"*

Collins engineer: *"Don't oversimplify your story of omni operation. Sure, VOR is a big step forward and it makes things a lot easier for pilots, but it isn't quite as simple as some of the ads and booklets make out."*

These principles were briefly covered during the RTCA morning meeting after which the session was turned over to the more technical phases of the Transition Program.

▶ **Transition Program**—The afternoon session was given over to a brief description by engineers of various companies and agencies, of each of the 11 elements in the Transition Program. These papers have been made available to those who attended, and condensations of practically all of the papers will appear in NAVICOM during the next few months.

At the Friday gathering, these 11 elements were shown integrated into a Transition Airways System by means of a CAA film, and the chronological account of a flight, step-by-step. This was followed by a status report of the implementation of the Transition Program (to be summarized next month), a discussion of the capabilities of the system, and a lively question and answer period conducted by Dr. J. H. Dellinger.

The net impression was that the Transition Program is gaining momentum and that progress from here on in will be accelerated.

Airline Pioneers Omni-Range; Installs Equipment-Check Unit

American Airlines uses ARC Signal Generator to give pilots positive check on Omni in planes

By D. S. LITTLE

Supervisor Airways Aids, AA

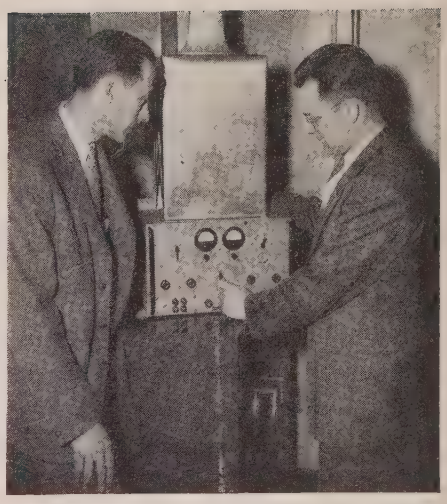
Installed in one of American Airlines' hangars at La Guardia Airport is a novel, specially modulated VHF signal generator about the size of a suitcase. While strictly a functional device, this recently developed H-14 Signal Generator, produced by the Aircraft Radio Corporation, is also, I believe, a symbol of American's pioneering in the field of Omni-range navigation.

▶ **La Guardia Unit**—The only such unit known to be in use at La Guardia, its signals are presently adjusted to reach out only as far as the most distant of our gates at the loading ramp and the fringes of our own apron. While we have suggested moving it to a spot where it might serve all aircraft operating from La Guardia, little interest in accepting the offer has been evidenced by others to date.

This is an indication that American is currently the only major operator at the airport which requires such a unit—a device which makes possible a complete operation pre-take-off check of the aircraft VHF navigational receiver system for both Omni-range and ILS Localizer signals. Our fleet of 49 DC-6's and all but nine of our 74 Convairs have been equipped with the Collins-manufactured 51R1 receivers. The remaining nine Convairs will have them within the next few weeks.

We needed the ARC Signal Generator. Our pilots wanted a positive check on the operational adequacy as well as the accuracy of the equipment in their ships. The H-14 makes it possible for them to check fully and with convenience the antenna-to-indicator reliability and accuracy of the 51R1 prior to take-off. They can now be certain that if a take-off emergency develops during IFR operation they have the aid offered by the ILS Localizer in regaining the field.

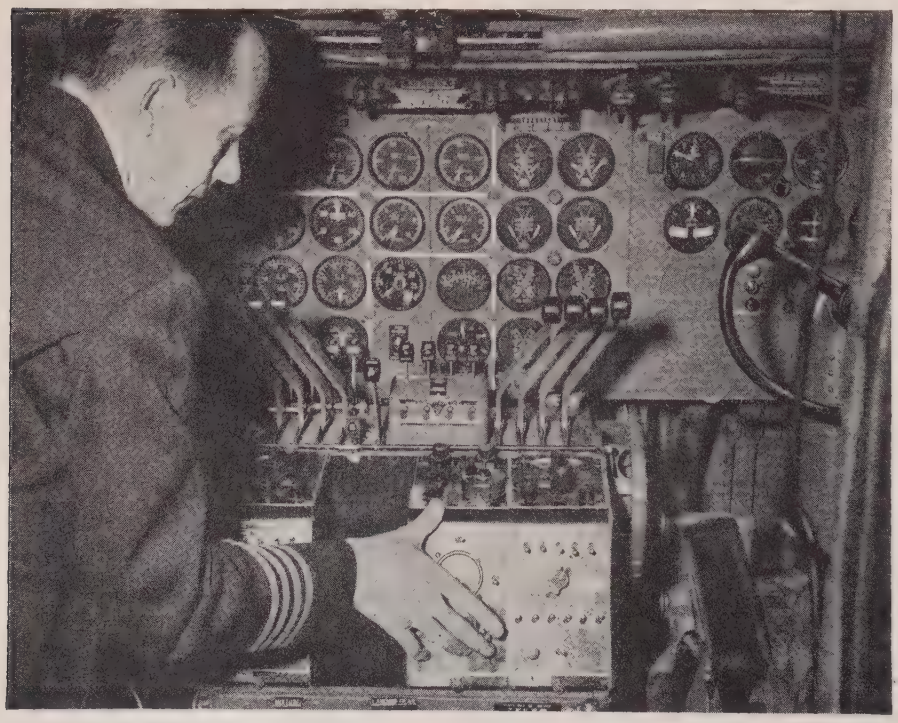
▶ **Tulsa-Nashville Omni**—Since last November, American's flights between Tulsa and Nashville have been navigating on Omni-range. An uncontrolled segment of airway west from Walnut Ridge, Ark., into Tulsa formerly was served by a radio beacon which American maintained and operated at Harrison, Ark. When the Omni-ranges between Walnut Ridge and Tulsa became available, we asked CAA authorization to use them and to discontinue the low-frequency navigational service so frequently adversely affected by atmospheric static. Granting of our request made possible the first scheduled flights on Omni-range in the country. Throughout the winter just past, this method has been entirely adequate and very satisfactory.



D.S. Little (*left*) and J. Christiansen inspect H-14 unit used for VHF radio checks

▶ **New York-Buffalo**—American has also asked permission to use the Omni-ranges as a primary navigational aid between New York City and Buffalo. However, indications are that considerable time may elapse before our scheduled flights —or anyone else's—are allowed to do so. High-level policy decisions must be made by several Federal agencies before the CAA can grant the required authorization to us or others. This same situation exists throughout the nation and, although many omni-range facilities are installed and several are fully tested and operationally accurate, applications from other users are also pending.

Our ships very soon will all be equipped for VOR navigation; all of our pilots now are trained in the use of the new facilities. All we need to take this "step into the future" is the required Federal authorizations. In the meantime, American is receiving full value for its dollars expanded for Collins 51R1 receivers and the Aircraft Radio Corporation's H-14 Signal Generator. We find the added reliability of ILS Localizer information brought in by this new equipment adequate return for the investment made. The chance to train our pilots on Omni-range and, when the authorization to use it comes, the static-free and infinite-track Omni-range operation itself will be a "bonus" paid American Airlines on its operational pioneering.



American Airlines' Captain Little, in the cockpit of American Airlines DC-6 Flagship, gets ready to check the operational accuracy and adequacy of the Collins 51R1 VHF navigational receiver. AA's fleet of 49 DC-6's, 65 Convairs are equipped with 51R1's

Arcata Station Closes

The Air Navigation Development Board has announced the withdrawal of its sponsorship of the Landing Aids Experiment station at Arcata, California. This means the Arcata project is now officially dead, and leaves the CAA experiment station at Indianapolis, Indiana as the only such station that is functioning at the present time.

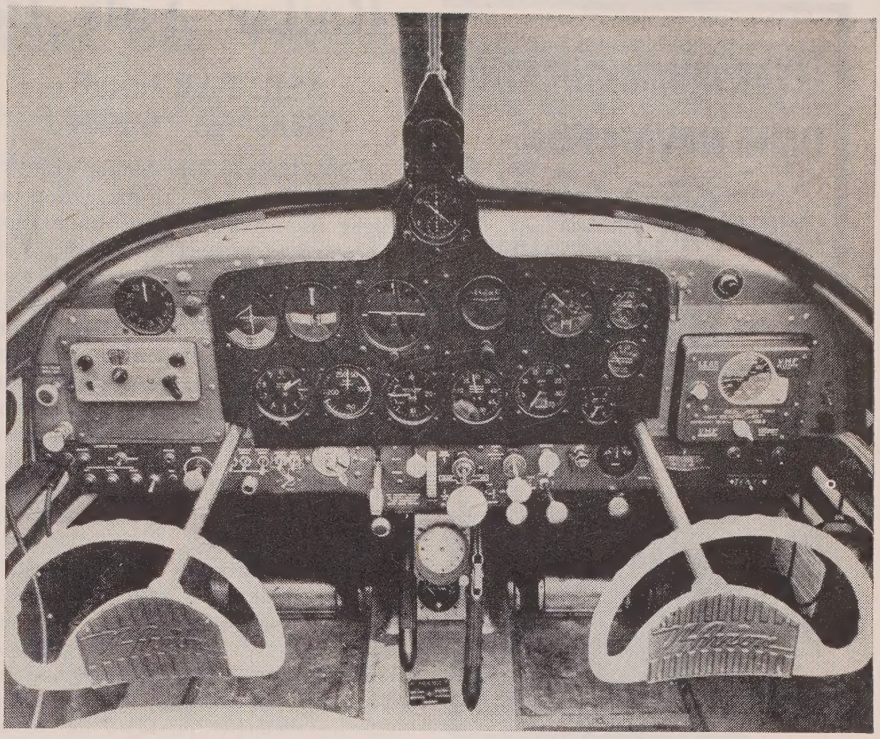
Asked why the Board had stepped out of the Arcata picture, a spokesman reported that at least one high-intensity approach lighting system for the RTCA transition program installation was already in being, and that no research or development was involved in the choice of the configuration to be used. It was further brought out that one of Arcata's high-intensity approach light system could permit regular operations under conditions of 100-foot ceilings and quarter-mile visibility, but the Board felt that the value of any contributions that existing types of visual aids could make to reduce those 100-foot, quarter-mile minimums would not only not warrant the heavy expenditures involved in the Arcata set-up but that such contributions were highly questionable in the first place.

Narco Announces T-3

The National Aeronautical Corporation, Ambler, Pa., has designed the Model T-3 Narco Omni Simulator to fill the need for field overhaul and major service on omnirange navigational equipment. The first set has been delivered and it is expected that all major Narco service centers will put this equipment into operation soon.

▶ **Signal Generation**—The T-3 Simulator generates all the signal components of an omnirange ground station, and the omni track, which is transmitted, may be set on any bearings by means of an accurately calibrated dial. This permits a complete calibration test to be made on *any* omni-range receiver, without removing it from the plane.

For major overhaul work on the bench, the test set produces the necessary signals to make a complete adjustment of all the necessary balancers and compensations that are required. The T-3 also produces the signals necessary for testing the adjustment of phase localizer approach equipment, tone localizer and VAR equipment.



LEAR ORIENTER ADF-12 *(left, see page 64)* installed in a Ryan *Navion* is similar to one used by Arthur Godfrey who never tires of singing its praises as highly useful device

Distance Measuring Equipment

▶**Why DME?** According to the SC31 report the "lack of distance information in the cockpit is a major navigational weakness." Next to getting the highly flexible, static-free VOR range program under way, DME has top priority.

▶**What is DME?** According to the Institute of Radio Engineers (IRE), DME is "A radio aid to navigation that determines the distance from a transponder beacon by measuring the total time of transmission to and from the beacon."

What is a transponder beacon? That's a ground beacon containing a radio receiver and transmitter which are used to receive a challenging signal from an airborne interrogator and transmit a replying signal in response.

▶**How it works** SC31 says: "The distance of the aircraft from the ground facility shall be derived in the airborne equipment using signals of the airborne transmitter for interrogation of the ground equipment and reception by the airborne receiver of the response."

▶**Where DME beacons placed** In order to get bearing and distance simultaneously, DME ground transponders will be located at omni-range stations. The only visible evidence of this will be the DME antenna appearing like a five-foot vertical stovepipe at the highest point of the omni-range structure.

Where is DME operating? Two installations are already operating at CAA's Experimental Station, Indianapolis; others are at Wright-Patterson AFB, Dayton; Patuxent NAS, Patuxent River; Terre Haute and Lafayette, Ind.; and Ogden, Utah.

▶**Beacon Builder** Hazeltine Electronics Corp. of Little Neck, L.I. makes the beacons and has a $4,210,750 contract (see photo, page 59) for broad frequency band DME beacons and spares; the Federal Telecommunications Laboratories system using narrow frequency bands has also been approved.

▶**Airborne Equipment** Who makes the airborne DME equipment? Several companies in the aviation electronics industry have I-R (interrogator-responsor) sets under development, and announcements may be expected within the next few months.

▶**When will DME be in operational use?** A start will be made within a year. It should be in full swing in 1952-53. Some 350 omni-ranges already are operating in the United States to give pilots exact information concerning the "flight paths" they wish to follow. The DME transponders, located at omni-range sites, will provide pilots with the second vital piece of information they require—continuous data on "how far" the plane has progressed along the flight path toward the omni-range station. It will appear on a simple cockpit dial, like an automobile mileage meter.

Radar Aids In

ASR, PAR installations go forward

Radar is rapidly coming into its own as a primary air-navigation aid. Eight improved Gilfillan installations, composed of airport surveillance radar (ASR) and precision approach radar (PAR) mark the first step in a big and important program. It will be recalled that the war-developed ground controlled approach radar system (widely known as GCA) consisted of a 10-cm search set for area traffic control within a 30-mile radius of the airport, plus a 3-cm scanning system with scopes providing precision range, azimuth and elevation.

▶ **New Installations**—The eight installations includes Los Angeles and La Guardia (now functioning), Chicago, Cleveland, Washington National, Atlanta, Boston and N.Y. International. They will replace the wartime surplus sets installed by the CAA for experimental purposes at La Guardia, Chicago and Washington.

Improvements consist of greater reliability and the elimination of ground echoes by means of MTI (moving target indicators). The ASR unit can "see" 30 miles in all directions, or 60 miles in one direction, using a scale of 6, 10, 20 or 30-mile surveillance. The moving pips show up so clearly on the circular PPI scope (plan position indicator) that the CAA has made provision for the use of ASR as an approach aid as well as for traffic control. Such approaches are called PPI approaches.

In order to extend the program to scores of additional airports, the CAA has issued bid invitations for 40 sets of ASR and 40 sets of PAR, the total amount of which will approach $9 million. This is in addition to a $3 million contract given General Electric some 18 months ago for 27 surveillance radar sets.

The next step in the radar landing aids picture is the Gilfillan Automatic GCA, which utilizes an autopilot control in the plane, actuated by signals from a ground AGCA station. The Air Navigation Development Board has authorized Air Force to conduct an evaluation of the system, but points out that operational use is several years away.

Another development in the picture is an audio-oscillating system to indicate to the airport ground control station when an airplane lands. A signal would be received on a controller's panel when the plane's gear touched down.

▶ **More ASR, PAR**—According to the accompanying table, 40 airports are scheduled to receive both ASR and PAR, in addition to the eight airports mentioned earlier. Twenty-three other airports (listed) are scheduled to receive ASR only. It is more than likely, of course, that as developments proceed some changes will be made.

CAA's Radar Installation Schedule 1951 — 1953

Airport	ASR	PAR
Birmingham	x	x
Nashville	x	x
Louisville	x	x
Burbank	x	x
Buffalo	x	x
Oklahoma City	x	x
Baltimore	x	x
Knoxville	x	x
Dayton	x	x
Long Beach	x	x
Minneapolis	x	x
Fort Worth	x	x
Harrisburg	x	x
Providence	x	x
Charlotte	x	x
Charleston	x	x
Milwaukee	x	x
Pittsburgh	x	x
Philadelphia	x	x
Detroit	x	x
Kansas City (Mo.)	x	x
Indianapolis	x	x
Seattle	x	x
Portland	x	x
Houston	x	x
Dallas	x	x
San Francisco	x	x
Newark	x	x
Oakland	x	x
St. Louis	x	x
Anchorage	x	x
New Orleans	x	x
Columbus	x	x
Denver	x	x
Covington	x	x
Memphis	x	x
Jacksonville	x	x
Tulsa	x	x
San Antonio	x	x
Norfolk	x	x
Corpus Christi	x	
Montgomery	x	
Austin	x	
Mobile	x	
Spokane	x	
Canton	x	
Richmond	x	
Amarillo	x	
Chattanooga	x	
Windsor Locks	x	
Omaha	x	
Wichita	x	
Toledo	x	
Great Falls	x	
Syracuse	x	
Fort Wayne	x	
Greensboro	x	
Albany	x	
Greenville	x	
Tampa	x	
Wilkes Barre	x	
Little Rock	x	
Augusta	x	

Private, Exec Pilots Use Omni

This is the aircraft equipment personal and business pilots use in navigating XC via omni-range

The most important single navigational device in the transition program towards the new airways system is VOR. This stands for Very high frequency Omni-directional Range. Omni is the Latin word for "all," as in omnipotent (all-powerful). In simplest terms, omni is a huge radio wheel with 24 spokes—15 degrees apart. Each spoke is a radio course, and static, wind or other variables cannot make it deviate. As of April 1, 1950, over 350 omni-range stations were in operation.

The program is now about 80 per cent complete. American Airlines is using it on certain routes, and thousands of executive and private pilots have been making increasing use of omni for more than a year.

▶ **Aircraft Equipment** — For multi-engine aircraft, Collins, Aircraft Radio Corp. and Bendix have produced satisfactory omni equipment. For single-engine planes, the Lear *Omnimatic*, National Aeronautic Corporation (Narco) and Mitchell VHF *Avigator* Omni-Range have been developed.

▶ **Omnimatic**—First to fly was the Lear *Omnimatic,* which hit the lightplane market in late 1948. Its name is derived from the fact that its action is automatic and instantaneous in presenting a visual bearing indication of the selected omni-range station on its *Omniscope*. There is no "ambiguity" as to whether you are flying toward or away from the particular station, involving the use of the "To-From" needle or switch found in most other sets.

The latest price of the Lear two-way VHF receiver and transmitter—which forms the basis of the new system—is about $525 installed in the average aircraft. For about $475 more, the *Omniscope* indicator, the *Omnipack* power supply (a generous 3-watts), *Omnitenna* and other accessories can be purchased, completing the *Omnimatic* system. The total weight is 24 pounds.

▶ **Narco**—The Narco omni-range equipment was flight demonstrated in the spring of 1949. It consists of the Narco VTA-1 VHF transmitter (which had been on the market for some time); the Narco VRA-1 VHF receiver; the Narco 12- or 24-volt MP-1 power pack; and the Narco omni unit, which can be simply plugged in if a plane is already equipped with the Narco transmitter, receiver—or both.

Once you have selected your course with the course selector dial, the "To-From" needle will tell you if you are flying toward or away from the station, reversing as you pass over it. A "Left-Right" needle, when kept on center, will tell you easily and unmistakably if you are on course.

The Narco VHF receiver and VHF transmitter cost $384, and the complete omni-range system sells for $609. For a 24-volt system, add $99 for dynamotor-type power modulator unit. Total weight of equipment is 16 pounds.

▶ **Mitchell**—The new 1950 VHF Avigator Omni-Range is manufactured by Mitchell Industries Corporation, Tex. The new model features seven radios in one package: VHF transmitter; tunable VHF receiver; range-band receiver; range and standard broadcast frequency directional loop and azimuth; 75-mc marker beacon receiver; and Omni.

The new Omni indicator is a telegon instrument which resembles a radio compass indicator, with a neon light mounted in the face. When the omni station is properly tuned, the light burns steadily; when either station or set is off frequency and unreliable, the lamp blinks; when off frequency entirely or if equipment is not functioning properly, no light.

Another feature is a rotatable glass dial with parallel lubber lines like those on magnetic direction indicators. When aligned with the indicating needle of the omni indicator, these lines give the correct course to the omni station. Price of the complete AVIGATOR set with Omni is $635. Installed weight, 20 pounds.

▶ **Aircraft Radio Corp.**—For four-place or larger executive aircraft, A. R. C. has developed Type 15B Omni-Range Navigational Receiving Equipment, covering 108-135 mc. Includes cross pointer, the course selector and TO-FROM indicator. Weighs 22 pounds. Localizer and VAR is optional, additional weight, 5 pounds. This ARC Type 15B is a highly satisfactory medium-cost set.

Microwave Radar Adds to Pick-up Range at Altitude

One trouble with radar as hitherto adapted for air-traffic surveillance purposes has been that it only "sees" for a distance of about 30 miles. By using microwave radar and amplifying the echoes in special receivers and passing them through a master control unit, traffic controllers at London Airport are now able to pick up aircraft from over 125 miles at 20,000 feet, and for over 90 miles at 10,000 feet. When aircraft approach the airport, a precision approach radar takes over.

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Radio Procedure For Pilots

As more and more private planes are being equipped with two-way radio, it is becoming increasingly important for private pilots to know proper radio procedures. Here are some "basics":

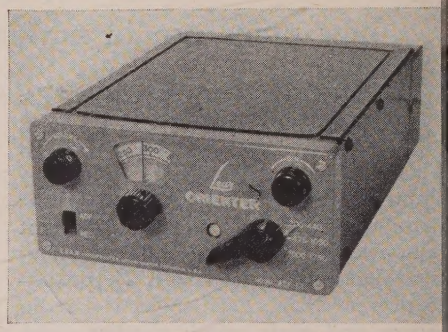
▶ **Communication Contacts.** Pilots of planes with two-way radio should make communication contacts required by IFR, no matter how good weather is.

▶ **Inbound Aircraft.** Pilot shall call control tower for local traffic information and landing instructions when over or near contact reporting point for airport at destination, or 10 to 15 minutes before ETA. When flying in an airway traffic control area, pilot should not call control tower for traffic info until cleared to tower.

▶ **Outbound Aircraft.** After take-off, pilot should continue to guard control tower frequency until tower operator indicates he has no further information, or until plane is outside airport zone.

▶ **Call-Up Procedure.** Following procedure is used by pilot calling the tower: 1) Station called, 2) By whom, 3) Reply, *i.e.* "Detroit Tower, This is Stinson One Seven Four Two Three, Over." Tower reply will be "Stinson One Seven Four Two Three, This is Detroit Tower, Over." At this point the pilot shall give tower the following information: 1) Geographical position, 2) Time, 3) Altitude, and 4) the course if flight is not in accordance with the approved flight plan, 5) request for instructions.

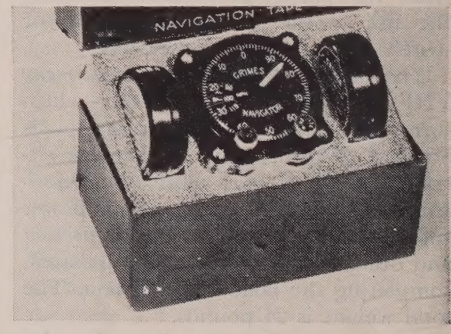
PRODUCTS



▶ **Lear ADF-12 Orienter**—This lightweight automatic direction finder was designed to meet airline standards, and yet be light enough, practical enough and inexpensive enough to suit the needs of the man who flies his own plane. Consisting of a tuner, amplifier, azimuth indicator and loop assembly, the *Orienter* meets USAF and CAA design requirements for use in jet, transport, executive, liaison and personal aircraft.

Weight is 18 pounds, price in U. S., F.O.B., Grand Rapids, $695.

Simplicity of operation is summed up in three key words: (1) TUNE in the desired station to "home" on one of some 2500 broadcast, radio range, and Coast Guard radio-beacon stations available; (2) TURN the aircraft until the indicator needle points straight up (360° or 0°); (3) FLY the "zeroed" pointer until it reverses to 180, indicating arrival over "home" station—you were flying TO the station, you are now flying FROM it.



▶ **Grimes Navigator**—A new flight instrument, the Navigator tracks an aircraft along its course on a cross-country. The instrument, in conjunction with its Navigation Tape, automatically converts time to distance. To use it, the pilot sets his estimated ground speed on the instrument, then starts its built-in timer. At any point en route, the pilot can read off the face of the gadget the number of ground miles he is from point of departure. The Navigator works for both Sectional and World Charts, and adjusts for ground speed from 65 mph to 240 mph.